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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

The Whitehill Corliss Engine.

We present engravings representing two views of this engine, which is built at the Newburgh Steam Engine Works, Newburgh, N. Y.

The chief peculiarities of this engine are in the mechanism for operating the steam valves. The arrangement of valves is the same as ordinarily employed in the Corliss type of engine.

The steam valves are operated by a parallel bar hung on idle cranks of same throw as steam gim cranks, these idle cranks being supported by arms cast on steam bonnets. The parallel bar carries on each end a right angle tripping lever, the lower end of which forms a knuckle joint with a link, which connects to pin on gim crank. There is a toe projecting on bottom of link at center pin which rests on parallel bar when in position to open valve, and is arranged to adjust center pin to proper height.

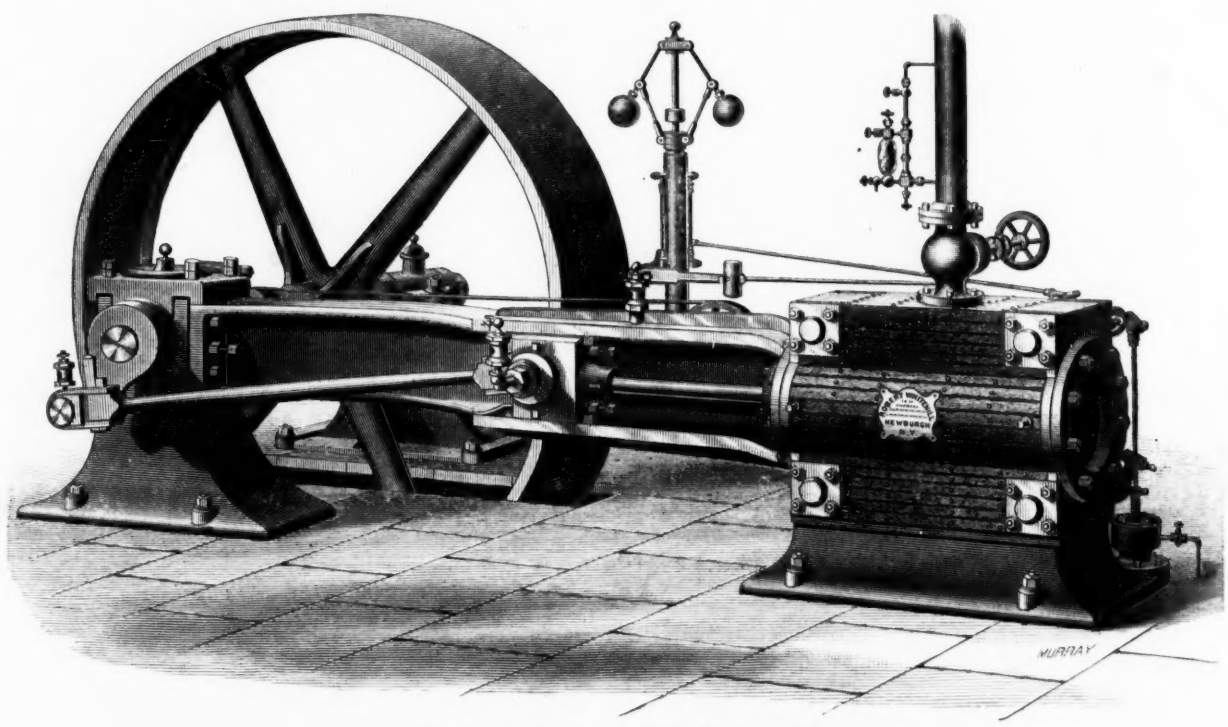
The parallel bar being swung by cranks of same throw as steam gim cranks, causes the three pins forming knuckle to travel in same plane. The projection on link which rests on parallel bar is adjusted so that the center pin is a trifle below straight line drawn through the two outer pins, which holds the connection stable or in equilibrium while the valve is being opened. The upper end of tripping lever coming in contact with tripping toes while parallel bar is advancing, raises the center pin (forming knuckle) above a straight line or out of equilibrium, and the dash pot closes the valve, the knuckle joint doubling up like the leaves of a hinge.

The tripping levers striking toes in a straight line cause very little strain on governor. The parallel bar on return stroke pulls the knuckle joint down in position, and makes a positive connection for opening the valve.

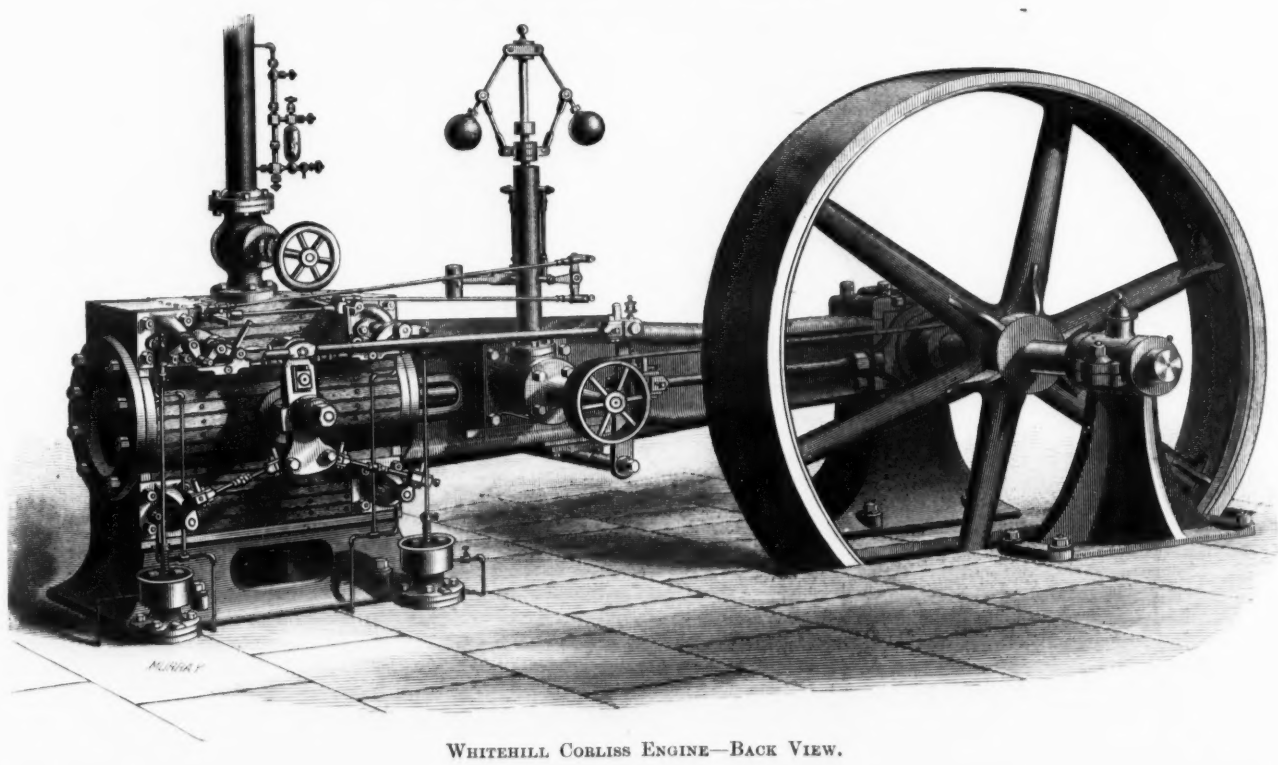
The automatic regulation of the engine is effected by tripping toes, which slide on a square bar supported by arms from cylinder, which are adjusted by the governor, thus varying the point of cut-off, the range of which is from zero to three-quarters of the stroke of piston.

The vacuum dash pots are arranged with a compensating connection and lift only during opening portion of gim crank travel. Having no disengaging apparatus all parts of valve gear being positively connected, without the use of springs, it is claimed that repairs are reduced to the lowest cost. All parts are made of best materials, and to standard sizes.

The New York office of this company is at No. 6 Coal and Iron Exchange.



WHITEHILL CORLISS ENGINE—FRONT VIEW.



WHITEHILL CORLISS ENGINE—BACK VIEW.

Duties of a Foundry Foreman.

One of the most successful foundry managers in the country being asked by a young man about to take charge of a foundry to give him some points on the executive part of the business, sent him the following, which is worthy of being studied carefully:

1st. Good management means to discount hours of moulding (usually from 6½ to 7 hours). This is not always possible, but a close estimate can usually be made. A knowledge of this, and giving the subject thought on each job when given out, fixes it in the mind, and each floor passes in review mentally when a job is brought in for that day's cast at any hour before wind goes on.

3d. Look out for the cores; see to the venting and ironing, and see that they are prepared in advance of the moulders. A moulder's courage flags when his cores are not good or not ready.

4th. Patterns should be kept picked up, and see that they are not treated disrespectfully by the moulders.

5th. Watch the cupola; more trouble can come out of the average cupola spout than from anything I ever met, and I have ridden a bucking mule. Lay down the specifications as to quantities of the various grades of iron wanted in each charge, and, when everything appears to be running as well as can be expected, a complaint will come in that castings are coming hard, certain things are cracking that never cracked before, and you will find that there is a quantity of this quality made. Melter and helper will claim they have not made any change in the manner of charging. The only thing to do is to get right up on the stage and start them charging, just as they did yesterday; tell them not to deviate. They won't go far until you begin to bite your lip. Show them where they have erred, and impress upon them how important it is to keep right to the text as you have laid it down.

6th. Strict attention to details; in fact, good management makes the work run smoothly. Forgetfulness and procrastination, or delaying the starting of a job, makes ofttimes needless hurrying, irritates the men, makes them careless, and breeds discontent and a desire to go West.

7th. A course that will avoid many tight and close calls on your time is to have an eye or build on the future as the judgment dictates; see that each employe is employed, and lay as near as possible proportionate loads on each, without fear or favor.

2d. Estimate should be made of how long it will take the moulder, when a job is given him, to have it closed and ready; to know how many moulds should be made in the

open for jobs that are to come, and are yet in the pattern shop being completed. (Patterns.) Take an occasional look in the pattern shop; see what is being made, when it will be done, how soon the castings are wanted, and you can form an idea of whom to give them to, who is best qualified to make them or who will be at liberty, or so plan that the proper job is put in the proper hands as regards certainty of action and economy of labor.

8th. In fact, it means an endless, ceaseless watchfulness to so manage a foundry that profits will accrue and your conscience not disturb you.

Making Large Elbow Pipes on End in Loam.

By S. Bolland.

Very large elbows are usually made in as short lengths as possible, and very rarely exceed a quarter of a circle, in which case they are readily made on the flat. But when, as is sometimes the case, a pipe is required, say 60″ diameter and 8 feet long on one end, a much better way can be found to make it. And as the instructions for this job will serve for almost any other having a large elbow cast on, I have taken pains to show every detail of the operation. A careful study of the engravings is almost all that any intelligent moulder will require to enable him to grasp the idea. But, as my object is to instruct such as have had little or no experience in this class of work, I shall take the job in detail and explain from beginning to end how to make an elbow pipe 5 feet diameter 3′ 6″ and 8′ 6″ from center of elbow.

First. Let cope and core of long end be built and swept in the ordinary way, with sweep and spindle up to the turn shown at *A*, Fig. 1. The outer lines of Fig. 2 represent plan of foundation plate and cope ring. At *B*, Fig. 1, is seen the binding ring for cope, which is cast to outside dimensions of brickwork, and extending at the front the same distance as bottom cope ring, and wide enough to permit the guide pieces *A*, Fig. 2, to rest on it. A smooth bed of loam is struck at joint *A*, Fig. 1, on cope and core.

Now, let these plain parts be closed together in the pit, and as you must work around your mould, cover the mouth of pit with planks. Fill up the thickness with waste or hemp, and lay on the guide piece *A*. A side and end view of this guide is shown at Figs. 3 and 4. The half flange must be attached to this guide at its proper distance from center, and the whole frame set to center lines drawn on the level bed, as shown. The sweeps for forming the elbow will run on these guides, with stops, as shown at *A*, Fig. 4, and after the ouside is built, as at Fig. 4, the thickness must be placed on and the core built.

Figs. 1 and 4 are side and end elevation of core, and show the way to construct it. At *A*, Fig. 1 is seen the bottom plate, having staples cast on the upper side, to bind the plate *B*. These staples are shown in plan, Fig. 2, marked *I*. Four internal lugs are cast on this plate, with staples cast downward; these, as will be seen, are used to bind the core to foundation plate, in which corresponding lugs must be cast. This plan of securing the elbow to the body core does away with the use of chaplets, and makes the job absolutely safe as regards metal oozing through the joint.

Let this plate be solidly bedded on the joint, as shown, with no loam under it, set in the hook bolts and build up to *B* with an ordinary double course of brick, using the reverse sweep on guide, as shown. By referring to Fig. 4, it will be seen why this brickwork is carried so high. It allows of a sufficient width of plate to carry the sides of core, which, as is seen, is built on plate *B* as far as plate *C*. It will be seen that plate *B* has not only holes cast in to receive bolts from plate *A*, but other staples are shown, which serve to secure the top plate *C*, and so bind the whole core together. These staples are seen in plan Fig. 2, marked 2. The long staple *D*, and lugs *E*, are shown in plan at Fig. 2, marked 3 and 4.

Let this plate be turned over after it is made, and after filling in the cinders about half way of the prickers, fill up the rest with loam and pieces of brick. If you are careful in making the plate to have the prickers in the right length to suit the curve a very thin coat of loam will serve to bed down in. When this is dry enough to use, bed it into place and secure the bolts from plate *A*, and build, as shown, up to where plate *C* comes on. Holes are cast in plate *C* to correspond with staples in plate *B*. This plate with holes marked 2 is shown in plan at Fig. 2.

After securing plate *C*, fill in cinders among the prickers up to within 4″ of face, and ram over this plate with good open core sand. The brick work can be strickled off with loam in the usual manner.

The reason I prefer core sand for the top is because the iron rests more quietly on sand than it does on loam. Before striking off the sand be sure and vent well down into the cinders. It is important that you should have as many holes as possible cast in these plates, to carry off the gas, and also have the brick work as open as possible, and well cindered in every course. After finishing the core let the upper half of flange be set on true, and put on the thickness. Oil all over, and throw on some parting sand; you may then proceed to build the outside.

At Figs. 3 and 4 is seen the way to build it. *A*, Fig. 3, being the first plate needed, staples are cast in this plate for the purpose of binding it to plate *B*. A plan of plate *A*, with staples marked 5, is seen at Fig. 2. The overhanging brick work can be supported with a building ring or plate, as shown at *C*, Fig. 3. Plan of plate *B*, with holes for bolts from *A*, and staples marked 7, carrying bolts to plate *E*, with lugs for lifting, marked 6, are seen at Fig. 2. A method of building this part is shown at Figs. 3 and 4, with top covering plate E bolted down.

After all is built, and the requisite marks made for guides, the top can be lifted away. Dig out about 2″ down of the thickness, to save pulling up the joint, and then lift out the elbow core. The thickness being cleaned out of the bottom half, and the waste or hemp removed from around the mould, you can—after making sure of guides at the bottom seating—again separate your moulds and finish for drying. Should it be found to be inconvenient to handle the whole cope when the under half of the elbow is built on it, or should the mould be too long for the oven, the plain part can be divided by an extra cope ring at any point you may choose.

The rest of the job is plain, each piece finding its own place in the order they were separated. After the elbow core is in place the bolts *G*, Fig. 1, must be secured, as already explained, to the foundation. A little of the dry loam may be scraped out at the joint *H*, Fig. 1, and wet loam pushed into the space, as shown.

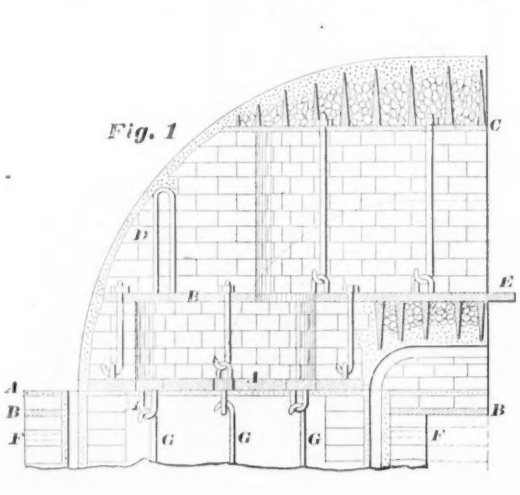
Should there be any doubt as to the strength of building ring *B*, Fig. 1, piers can be built up from cope ring to support the front, as shown by broken lines.

To gate such a casting as this, let the bottom flange be covered well by runners leading thereto, before you rise up to the main runners, which are shown by broken lines at *F*, Fig. 1. As many of these runners can be put in as will run the casting at a fair rate of speed until the iron reaches about the height of the plain part, or even a little below, when runners *D* at top flange, shown at broken line, Fig. 4, must be used.

If two ladles are used to cast with, all the better; a separate runner can be made for them; but should only one ladle be thought necessary, let plugs covered with loam be inserted in these gates, and the runner made around them, withdrawing them in time to let in the hot iron to the top of the mould before the scum, which rises as the body fills up, reaches the elbow part.

Broken lines at *D*, Fig. 3, show the risers.

The vent can be taken from this core by dropping dry shavings to the bottom of core, and running a little molten iron down to ignite them just before casting.



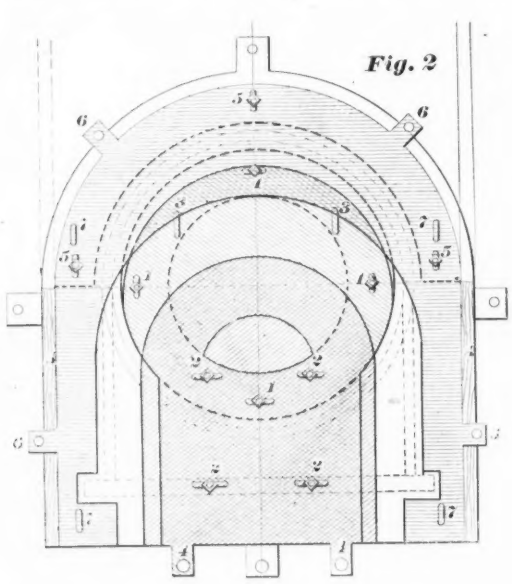


Fig. 2
6
6
5
5
1
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1

same amount and kind of work would avoid much unequal competition, and result in a distinct benefit to all concerned, employers and employed.

The man who can point out a universal panacea for all labor troubles is still around, but he has not been listened to during the last few weeks with as much interest as he was last year. There are several of him, and his views are very divergent.

A mechanical question which has been suggested, but which the public would hardly care to have discussed just now, is the relative merits of the rifles Herr Most offers to sell his Anarchist followers (on the instalment plan) to murder capitalists wherever found, and those of the Winchester pattern, placed in the hands of desperadoes hired by certain railroad officials to shoot down men and women who ridicule the bearers of these weapons. There is, however, no question about the style of cell which should be occupied by the promoters of such rifle practice, or of the punishment meted out to the murderers. The fact that the latter variety of shooters are sometimes sworn as deputy sheriffs while acting under the pay and direction of their masters who hired them, does not alter the case a bit.

A model from which, it is claimed, was made the first device used by a locomotive in the United States for taking water when in motion, may be seen at the Young Men's Christian Association reading room in the Grand Central Depot, New York. This model varies but little from the apparatus now in use by the New York Central and Hudson River Railroad.

Blue prints which show a yellow tinge are defective, usually from one or two causes. Either they were not thoroughly washed after exposure to sunlight, or the solution was too thick when applied to the paper.

A locomotive with very short stroke has been found to give excellent results where time *must* be made and many short stops are unavoidable. Under these conditions, a 17″x20″ cylinder proved a success; but strict economy of fuel was overlooked.

Railroad Mechanical Notes.

The New York Central and Hudson River Railroad have shops at Buffalo, Albany, Syracuse, and a small shop at 31st street, New York City.

The entire rolling stock, consisting of 676 locomotives, and 25,161 cars, together with the equipment of the West Shore road being 177 locomotives and 7,291 cars, is under the supervision of William Buchanan, Superintendent of motive power and rolling stock.

Formerly the M. M. of each division of the road was authority for changes, purchases of locomotives, and other material, but during the past five years Mr. Buchanan has so far perfected and organized his department that expenses are reduced to a great extent, and a better service furnished.

Nearly 850 locomotives are in use, and a record of their whereabouts is kept by means of a check board in Mr. Buchanan's office at Grand Central Depot, New York.

Each division of the road has a separate space allotted to it on the locomotive check board, and each space is divided into three divisions, indicating "good condition," "fair," and "needing repairs."

Each locomotive is represented by a pin, which fits into any of the holes in the check board. The head of pin is about 1″ in diameter. Part of this head is painted to show the division to which the locomotive belongs. For instance, a chord of an arc painted yellow, may denote the western division; red, eastern division; blue, Syracuse division, etc.

A letter stamped in center of head, tells class of engine, and just below this letter is P, for passenger, or F for freight engines. At the right of this last letter, a five-sided character denotes that the engine is fitted with an air brake, and a similar figure at left of P or F tells him that the engine is fitted with driver brake.

A star placed to the right of engine number on the plug means that the cylinder is more than 17″ in diameter. If this star occurs on the left of engine number, the cylinder is 17″ or less in diameter. This mark serves to show at a glance whether the engine be large or small; and if an 18″ cylinder gets placed upon the switching engine division of the check board, it becomes easy to detect the fact at a glance, and to order a smaller locomotive to be used in place of the large one.

On the side of each plug, the size of cylinder is stamped, and on end of plug which goes into check board, the size of drivers is marked.

It was noticed that but very few plugs were sticking in the "fair condition" portion of the check board, and but three or four were checked as "needing repairs."

A section of the board represented the repair shops, and from it could be determined whether any locomotive was being "thoroughly overhauled," or undergoing "light repairs."

From a daily report file Mr. Buchanan is able to tell how long a car or locomotive has been in for repair, and also just how much and what work is being done at any shop at a given time. If he finds the Buffalo shop has got ahead, and Albany shop is crowded with work, a train is made up at the Albany shop and some of the cars needing repairs are sent to Buffalo.

A "book of information" is kept by Mr. Buchanan. By reference to it he can answer at any time the thousand and two questions which are likely to be asked him in relation to number of men employed, their salary and duties, statistics of the road, condition of any particular article or its location.

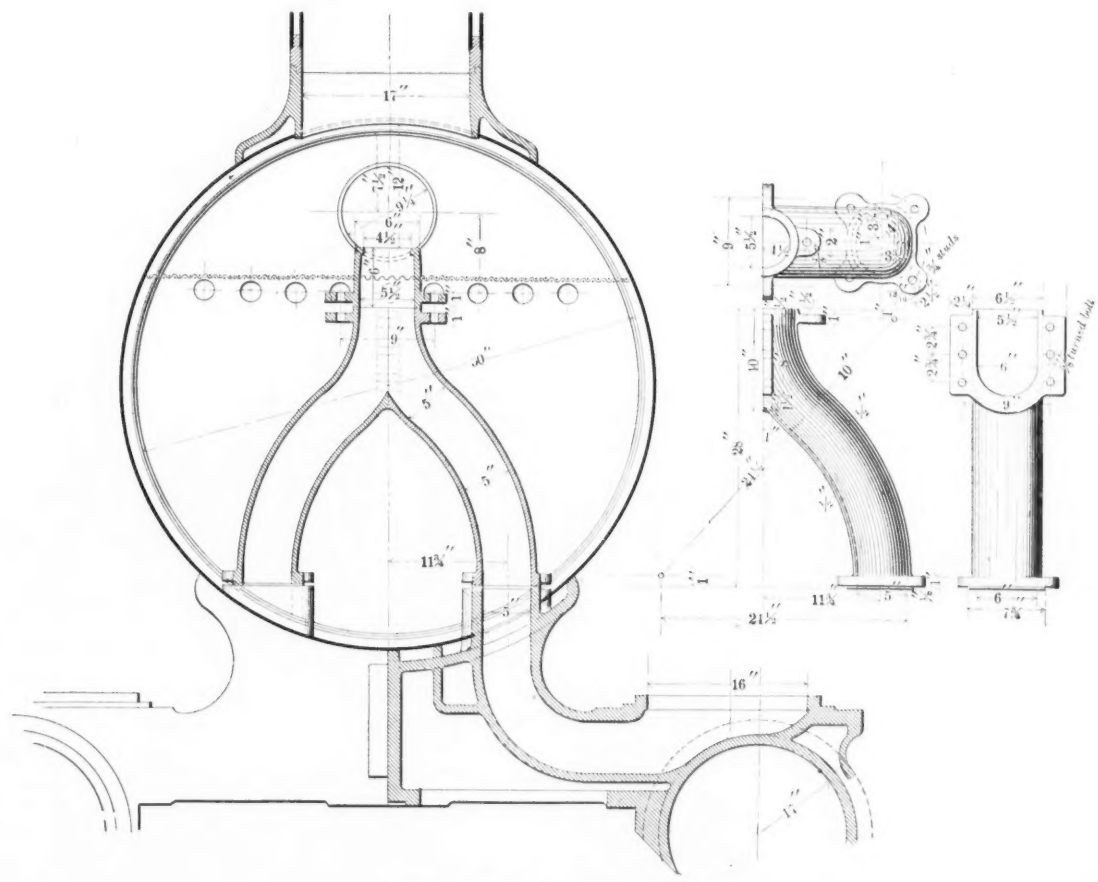
A handy pocketbook which, like the one above described, is to be carried when out on the road, contains data in a condensed form concerning cars and engines.

It includes freight and passenger cars, as well as locomotives. The annexed table represents a page of this book, and gives dimensions of the new A² locomotives which are just being put on the road, and which are built in the company's shops:

CLASS A².

Cylinder, diameter and stroke..	17″ × 20″
Boiler, diameter smallest ring.	48″
Boiler, height wagon top..... .	11″
Fire-box, length and width.....	74″ × 43″
Fire-box, depth inside.....	70½″
Tubes, number.....	197
Tubes, outside diameter.....	2″
Total heating surface, square ft.	1,260
Weight of engine.....	78,100
Weight on truck.....	28,400
Weight on drivers.....	49,700
Weight of tender.....	60,000
Capacity of tender, water.....	2,500
Capacity of tender, coal.....	10,000
Weight of engine and tender...	138,100

Each table, which occupies a page of a 2¼″ × 4″ book, is accompanied by a sketch of car or engine, the whole forming a valuable book to "have on hand."



IMPROVEMENT IN LOCOMOTIVE DRAFT.

An Improvement in Locomotive Draft.

Having heard that Mr. J. N. Lauder, Superintendent rolling stock of the Old Colony Railroad, was building two locomotives of new design intended for speed, we addressed him an inquiry and received the following reply: "The only change of any importance that I am making in locomotives is in the exhaust pipes. I send with this a blue print which will explain itself. I find in using the extended smoke arch and baffle plate in front of the flues that the exhaust pipe put in the usual way obstructs the draft very materially, and this design is intended to obviate this difficulty."

The engraving on this page is made from the blue print enclosed by Mr. Lauder. The new locomotives upon which this arrangement is used have 17″x24″ cylinders and 52″ drivers.

Making a Brass Straight-Edge.

A workman attempted to make a brass straight-edge 1¼″ wide, ⅜″ thick and 4′ long. A strip was cut from a sheet of rolled brass and straightened by hammer and press.

It was clamped to planer table, and one edge planed up. When taken from the planer the brass sprung about ¼ of an inch.

It was put under the screw press, straightened, and a light chip taken from the same edge.

Upon turning the straight-edge and planing the other side, the "unexpected which often happens" was apparent. The brass sprung up ⅜ of an inch in the middle of its length.

The strip was again clamped as it lay loose on the planer, and the "belly" portion planed off. When unclamped the piece of brass again jumped up nearly ¼″ in the center.

The material was then abandoned, and another strip cut from the same piece of brass, straightened as the first, and one side planed.

Upon being removed from the planer this strip sprung as the first one did, but instead of straightening it under the screw press it was turned planed edge down, forced down upon the platen, and clamped in a straight position.

When the strip was removed after planing the remaining edge, it did not spring up like the first one, but remained nearly straight.

Employers and Employes.

Our foundry contributor, Robert E. Masters, who received a high compliment from the Eclipse Wind Engine Company, upon resigning the charge of their foundry to superintend the Tredegar Works Foundry, as noted in these columns two weeks ago, also received a testimonial from the workmen of the former establishment just before going away. It was in the form of a beautiful Knights of Pythias charm, and Mr. Masters in replying to the presentation address said that he fully appreciated the kind spirit manifested by the donors, and he should always cherish the emblem with feelings of pride as well as kindness, to know that so many of his fellow workmen had trusted in his endeavors to deal honorably with them, even when he seemed to be enforcing strict discipline. It is a very difficult matter to stand between workmen and employers and be regarded by both as just, and he felt complimented by the expression of confidence in his intentions by the foundry men, particularly as his employers had kindly expressed their satisfaction with his labors. If the employes of the foundry do as well by the new foreman, Mr. Whitcomb, as they had done by him, he promised that there should be no trouble between the men and foreman.

A reader calls our attention to the fact that more than half the advertisements contained in the "Wanted" column of our May 15th issue, related not to situations wanted but persons wanted to fill various situations. This looks like an encouraging sign for the present and prospective condition of business.

It is confidently stated that four of the largest railroad corporations in the Northwest, viz., the Chicago, Rock Island and Pacific, Chicago and North Western, Chicago, Milwaukee and St. Paul, and Northern Pacific, are preparing to construct during this year an extraordinary amount of new mileage. Some accounts place the figure as high as 2,000 miles. Even if this figure should not be reached, there is no doubt that these four corporations alone will build enough miles of railroad to exercise an important influence upon the railroad supply business, and general business throughout the country. The new lines to be constructed lie mostly in Nebraska, Dakota, Wyoming, Washington and Montana.

The *Railroad Gazette* has information of the laying of 577 miles of new track this year (not including sidings or second tracks), as against 308 miles for the same part of last year, and 397 miles for the same portion of 1884.

Hydrostatic Weighing Instrument.

Fig. 1 represents a handy device for weighing large castings, or other heavy bodies.

This instrument is shown as first made by John Robertson & Co., Brooklyn, N. Y., for testing the power exerted by a Boomer press. It is simply a cylinder in which is fitted a ram resting upon a small amount of water or other liquid contained in the cylinder.

A hydraulic gauge is connected with interior of cylinder, and indicates the pressure applied to water through the ram.

Fig. 2 is a view of interior of cylinder. The hole *a* serves as a guide to the ram, or by receiving the plug *b*, Fig. 3, and prevents injury to packing by possible canting of the ram.

The body of the cylinder is a wrought-iron forging. The pipe connecting with gauge is tapped into cylinder at *c*, below bottom of main bore, in order that the ram may not interfere with it should the liquid chance to escape.

The pipe is soldered or plugged at the end which enters cylinder.

Fig. 6 illustrates this point. By making a small hole in the pipe, the gauge is to a degree protected when a heavy load is suddenly thrown on or off the ram.

The liquid is unable to flow quickly through this small hole, therefore the gauge has time to adjust itself to the load, and excessive fluctuations are prevented.

The small hole also serves another purpose, by retaining the liquid when gauge or pipe is removed.

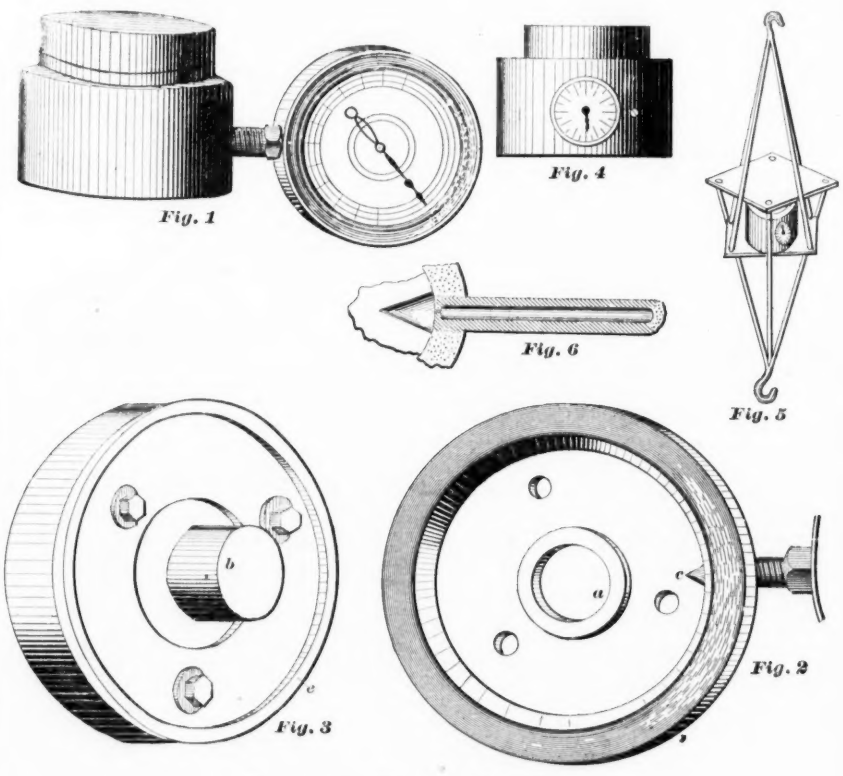
Fig. 3 shows the ram. It is a piece of steel turned to fit cylinder and carries a plug *b* to fit *a*, Fig. 2. The packing is made fast to the ram by a ring about $\frac{3}{8}''$ thick, which is secured by the three screws shown.

The packing is made of leather, cut about 1″ larger than the ram, and pressed while wet into a mould, which turns up the outer edge of the leather as shown in the illustration at *e*.

A very compact form of this tool is shown at Fig. 4. In this case, the gauge and dial are built into the body of the cylinder.

Although there is nothing new in principle about this device (being in use almost without exception when the hydrostatic press is used), a patent has been taken out covering the combination of a dial arranged like that in Fig. 4, with a bail passing down through the cylinder of Fig. 4, and secured underneath it by nuts, for the purpose of hanging the device to the chain of a crane or other hoisting machine.

As shown by Fig. 1, and in a more convenient form by Fig. 4, this machine may be used to weigh any body under which it can be placed, or, for a wide range testing. By the device shown in Fig. 5, the bail is dispensed with, although whether or not it infringes upon the original patent (which expires in 1889), is an open question.



HYDROSTATIC WEIGHING INSTRUMENT.

"Mechanics and Faith."

Below we quote some passages from Charles Talbot Porter's new book on speculative philosophy, bearing the above title. The book is noticed on another page. The quotations, as elsewhere stated, are from the more introductory portions of the book, and are mainly intended to illustrate the standpoint from which the book is written:

Above all other employments of a secular character, the study of mechanical science, using the term in its largest meaning, operates to familiarize the mind with the reality and the controlling nature of unseen things.

* * * * *

Among the things which are earliest taught to the student in any branch of mechanics is, to put down on paper imaginary points and lines, which are called centers and center lines. These are not seen in any construction, but they are the fundamental elements of every construction. They are the points in which forces are properly conceived to be gathered, and the lines along which forces act—in which these are transmitted or resisted. Mechanical structures and movements are primarily represented by diagrams consisting only of centers and center lines, to which, in the case of moving machines or bodies, there are added lines of motion, which represent the successive positions of the centers or of the bodies to which motion is imparted.

These points and lines are objects of purely mental perception. They have no material existence. But in the mind of the designer of any machine or mechanical structure they must always precede the idea of matter, and determine the order of its distribution or arrangement.

A familiar illustration of this requirement is afforded in the eccentric crank, by which the valves of steam engines are commonly actuated. No eye ever saw the center of an eccentric, nor the circular path in which this center moves. Both the center and its path are hidden in the solid interior of the shaft. But in every diagram of movements derived from an eccentric, the center and its path are the essential things, the only things pertaining to the eccentric itself which need to be represented.

Following upon these purely ideal points and lines, there comes the study of mechanical laws, in obedience to which force centers in these points, and is exerted or is transmitted along these lines.

* * * * *

The beginning of the cultivation of mechanics, in its various branches, as the science of force, marked an era of peculiar importance in the progress that mankind is making in civilization. The recognition of force, as a spiritual reality, manifested through the medium of physical forms, which is the characteristic of mechanics, required a certain degree of spiritual insight, and constituted the first advance made by men from that primitive perceptive condition, in which thought is limited to the material forms themselves, as these are disclosed to us through our organs of sense.

Thus the recognition of force was the first step toward the scientific recognition of all spiritual realities, which are manifested to us through the same physical medium, and of the Infinite Being in whom all these consist. And because it was the first step in this advance toward the perception of all spiritual realities in their unity, it was by far the most important one, as upon it all succeeding steps depend. It was also the step which was most slowly and gradually taken, and which it was necessary should be dwelt upon for a considerable time, in order that the mind might be prepared for those which were to follow it, in the natural progress of thought. Thus by mechanical science a wide door has been opened into the realm of the unseen.

* * * * *

Whatever be the particular direction that thought may take, human nature always manifests itself in essentially the same way. So it is the case in mechanics, as well as in other branches of science, and in speculative philosophy, that vagaries, more or less visionary, are appearing continually. In all these departments of thought alike, absurdities are continually being urged upon the attention of men. This is a general manifestation of the perverse tendency of thinkers, so-called, to be captivated by the work of their own imagination, and to proclaim this as the truth.

But there is a wide difference in the credence that these mechanical and philosophical speculations command. Mechanical science possesses the important advantage of being able to bring all conceits that appear in her realm sharply to the test of experiment. "How will it work?" is the pitiless question, and but little interest can be aroused in any supposed invention until this question has been satisfactorily answered.

One occasionally hears of a person who is cherishing a pet mechanical conceit. It is opposed to mechanical principles; but he is quite innocent of these, and, as they antagonize his supposed invention, he cannot admit them into his mind. He is sure of the soundness of his plan. It takes complete possession of him. Some one is induced, or more probably a number of persons combine, to construct a machine which shall at the same time demonstrate the invention, and show the inventor to the world.

A trial is made, and lo!—as was the case a few years ago with a propelling apparatus that was constructed on what was represented to be a new principle, and which, when it came to be tried, was found to produce no effect in moving the boat in any direction—the whole thing vanishes into thin air. The reflection of the thoughtful observer is: "What a pity that the same disposition cannot be as quickly and effectually made of the vain speculations which, under the name of philosophy, are continually wearying the ear." Here, for want of checks that can be promptly applied, we see advocates of all sorts of theories doing serious harm by confident assertions and plausible reasonings, which one experiment, if only it could be fairly tried, would dissipate forever.

Mechanical science operates powerfully, however, to reach absurdities of the latter character also, by its indirect influence, and by the general habit of thought that it develops. It thus becomes, in the largest sense, an important educator, and one the influence of which is felt throughout the masses of society.

Men, who in any department of mechanics with which they are acquainted observe continually the natural adaptation of means to ends, become accustomed to the uniform operation of unvarying laws, and see idle conceits, formed in contravention of these laws, continually exposed and thrown aside. In this way they insensibly acquire a stability of character and correct habits of thought, and are not likely to be led away by delusions of any sort.

They observe that in mechanics there exist fundamental principles which must be regarded, and they naturally look everywhere else also for general requirements of a corresponding nature. They become accustomed to reasoning with some degree of precision, so that vague generalities have little or no effect upon their minds. They consider, correctly enough, that absurdities are quite as likely to arise in other departments of thought as they are in mechanics; and they come to be on their guard against specious novelties, in whatever form these may be presented.

* * * * *

Let us now, by way of contrast, suppose a disposition of the latter kind, and approximations to which are by no means rare, in the case of a real inventor, who is possessed of that choice gift, a judicial spirit; a spirit humble, teachable, and honest, both with itself and others. Such a man conceives of something new, and which appears to him to be practicable. In reflecting on his idea, he finds after a while that he has reached a point, from which he can make no further progress by thinking. His invention has been matured in his mind, so far as he can go.

He now proceeds to construct his machine, or apparatus, or whatever the device may be, according to the light he has. Then he puts it into operation, sits down before it like a little child, opens his mind wide to receive instruction, and lets the invention itself teach him, by its practical working.

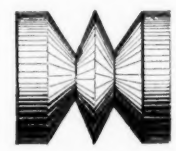
His spirit being entirely receptive, he is sure to receive the revelation. This revelation may be, it often is, that his scheme is radically defective, that his idea is a delusion, that there is nothing in it.

He recognizes the infallible character of the criterion to which he has appealed, and perceives the demonstration of the unwelcome truth in its full force. It costs him a pang and a tear, but, as he sees his dreams melt away, he feels that he has learned something, that he has been to the fountain of knowledge and has received instruction, and that he is capable of better things than he was capable of before.

Instead of total condemnation, the disclosure may be that something he never thought of, just in the last place he would have expected, is wrong or wanting. Sometimes defects will appear that puzzle him, and the nature of which can be discovered only by long study. Perhaps, again, the revelation may be—if the scheme is a radically new one it is pretty sure to be,—that extensive changes must be made, before the invention can be fairly judged. All real inventions are slowly reached through just such discouraging revelations.

A Point in Making Core Chaplets.

We note a kink in making chaplets in use by the Straight Line Engine Company, of Syracuse, N. Y., which appears to be a good one. When it is required that the work



should be steam tight, the chaplets are turned as in sketch. The central **V** being sharp, the metal is fused by the hot iron, and a perfect union formed, which effectually prevents leakage.

A writer in *Engineering* puts forth a plea for a revival of the paint formerly used for preserving iron-work. He says, in testing some of the iron-work of a bridge built sixty years ago, the paint scaled off in large elastic flakes, and that in none of the work tested was there a trace of oxidization, while in some of the more recently-constructed bridges "it is no exaggeration to say nearly an inch of rust has accumulated between the links."

Adjustable connections are not much used on locomotives. The connecting rod brasses are bored from $\frac{1}{64}''$ to $\frac{1}{32}''$ large, and bolted up solid, brass to brass. When the brasses become too loose, they are planed off and packed up in the shop. This method is said to give better results than are obtained by keying up connections on the road. The rods are always of the right length, and run much longer with out taking up.

The trustees of Battle Creek College, Battle Creek, Mich., are considering the advisability of adding practical instruction in iron-working to their industrial department. It is proposed to purchase a number of tools, including one 24″ engine lathe and one 24″x24″ planer.

A handy drawer for holding drawings may be made as follows: Length, 6″ longer than drawings; width, to receive drawing easily; depth, $1\frac{1}{2}''$. Let in a $\frac{1}{2}''$ top, flush with top of draw, and let it be long enough to leave an open space of 7″ at front of draw. When drawings are placed in the covered draw thus formed, one inch of the margin projects in view, and is all of the drawing that can possibly be reached by dust when draw is open. Two wedges, placed between drawings and top of draw, prevent all movement of drawings when the draw is opened or closed.

These draws are intended to be placed in cases—a set of drawings in each draw. Each draw should be numbered, and also marked with the name of the drawings therein.

A sheet containing labels similar to those on draws is hung upon the wall of drawing room, and serves as a handy index to contents of draw case.

Practical Methods and Rules for Laying Out Boiler Work.

By Charles Schaeffer, Jr.

The tools commonly required in the shop are a pair of trammels, with beam six feet long, a common 24-inch square, a wooden square with the tongue five feet long (not really necessary), a pair of dividers, chalk line and center punch, and a small hammer. Soapstone slate pencils are best, as they make a white mark, but French chalk is the best marker of all. Clamps are needed to clamp templet to iron, and a straight edge is indispensable.

To mark holes from templets on iron I use small pieces of gas or steam pipe about three or four inches long, and dip these in white lead, which leaves a nice round mark on plate. The outside of pipe fits the hole in templets.

THE CYLINDER.

The cylinder, says Webster, is a long, circular body of uniform diameter, but in boiler shops it may mean a great many other shapes. For instance, I have seen boilers when measured across the heads of same vary from $\frac{1}{2}''$ to $1\frac{1}{2}''$, but at the same time were meant to be cylindrical, the difference often caused by faulty laying out, also by the heads not being flanged true, and made worse in riveting by the holder on not being on rivet half the time while the riveters are banging away at the rivet; also by riveters drifting out holes which are not true. To avoid this, as far as laying out the work is concerned, it is necessary to be correct in every operation performed. When a sheet is selected, the side which is to be the outside of shell should be the one marked by stamp, which generally happens to be the smoothest and best side of iron, by some boiler makers called the "right side" of iron. This side is generally on top when sheets are sheared off in the mill. The under side may readily be distinguished by edge or burr on iron where sheared off, as Fig. 1 shows, when the stamp cannot easily be found. In all circular or rounding work in commoner grades of iron, let the grain of iron run with sweep of circle, but in superior iron this is not so essential to attain very good results, as it will readily bend or roll either with or across the grain, but the best practice is to form all grades of iron with the grain.

I commonly use the decimal 3.14 to figure the circumference from the diameter. To calculate the area of a cylinder use the decimal .7854 multiplied by the square of the diameter, or multiply half of the circumference by half of the diameter; result equals the area, which multiplied by depth gives contents of cylinder. In calculating length of sheet required for a cylinder to go over a given diameter, use the decimal 3.14, and add three thicknesses of plate to result, from center to center of rivet holes, as these three thicknesses of plate are taken up in the rolling and difference occurring by the plate diverging from a true circle where lap occurs.

If a butted joint is to be produced the decimal 3.14 alone gives circumference. If a cylinder is required, the outside of same to go into a given diameter, the simplest plan is to take inside diameter of the cylinder, add three thicknesses of iron, and desired diameter is obtained. If we require a cylinder of $\frac{1}{2}''$ iron to go into a $20''$ circle, inside diameter of cylinder wanted is $19''$. We find the circumference to be $59.66''$, add three thicknesses, which is $1.5''$, and we obtain $61.16''$ for the small end.

By a similar method we find the diameter of large end to be $64.30''$, and the difference is $3.14''$. This rule I use for plates up to $\frac{1}{2}''$ thickness, which makes the difference about six times and a little over between a course to go over a given diameter and one to go into same.

For plates heavier than $\frac{1}{2}''$ I use seven times the thickness of plate for difference between large course and small one.

In the above calculations no allowance for lap has been made, which will have to be added according to thickness of plate, and whether single or double rows of rivets are used. To lay out a sheet or plate for a

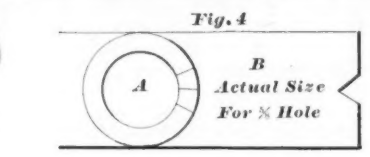


Fig. 4

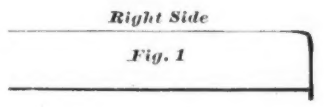


Fig. 1

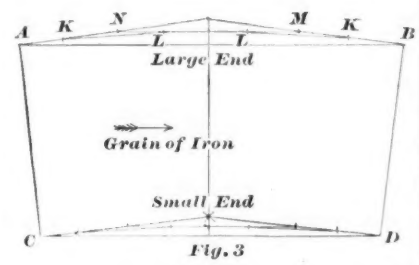


Fig. 3

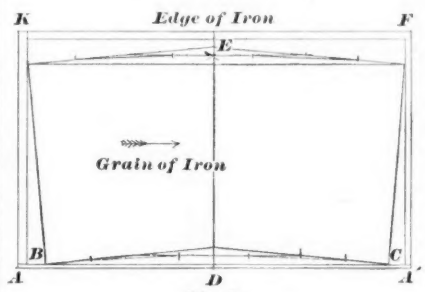


Fig. 2

cylinder or straight course the first step to be taken is, draw a line on plate about $\frac{1}{8}''$ from edge of iron with chalk line; this line must be absolutely straight, as in Fig. 2, A to A'. Measure of distance required for circumference if sheet is long enough for entire circle wanted, which in this case will be assumed. The drawing shows distance wanted, B to C. Divide line A A' at center D. Take trammels and set same any convenient distance so that marker of same would cut sheet at or near E. With C and B as centers erect line D to E. This would be center line of templet and square or perpendicular to line A A'. Then take at point C trammels and mark off height wanted for cylinder at F, the same from point B to K at other end, also from point D in center at line A A' on line E D

From point obtained on line D E set trammels, same distance as D to C, or D to B on line A A', and mark off distance to intersect height at F and K. This is what is commonly called squaring a sheet, and is, perhaps, the only reliable method to do the work right. Draw line K to F, B to K and line F to C, and the required pattern, as far as size is concerned, is obtained. Now allow for laps, mark off holes for rivets, as desired, and the drawing of templet is complete.

The result of the foregoing method is the ground work of exact and precise work, although when the student becomes expert, he may easily arrive at the same results by using a square; but I would urge all beginners to fully master the principles therein set forth.

Fig. 3 is a course with large and small end; although not strictly a proper cylinder, but a frustum of a cone, it comes so near to a cylinder that I have concluded to call it so.

Fig. 3 shows a simple and easy method to develop the templet called for. Take A B as length of sheet for large end, C D for small end, C to A and D to B for height or length of course. Make line A K N at right angles to line C A, and the same with line M K B; these will intersect at center line on top. For small end make D to X and C to X at right angles to C A and D B. These will also intersect at center line of sheet. Now divide line A K N at N, which is center of A K N from A to where A K N cuts center of sheet. Do same with other side as at M, which is center of B K M, to center of sheet. Draw line N to M; divide this line into four equal parts, as from L, center of sheet. Divide A to N in equal parts, also M to B; mark off lines K to L and L to K on both sides of center. The space between line A to B, and where all the other lines intersect, shows curve of radius; where the greatest accuracy is required, can divide lines as many more times as desired. Perform same operation on small end of templet, as is fully shown in drawing. The length of course is, of course, measured on curve for whatever circumference is required. Fig. 2 shows a templet marked on sheet, sheet being squared, as former method explains, with a paper sheet, marked on same; also show how grain of iron should run by arrow.

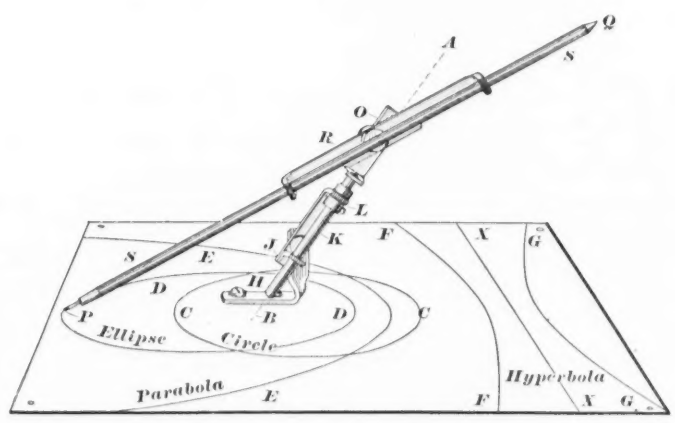
Fig. 4 shows marker as described. A is plan and B is side elevation of same; cut a notch out of same, as shown in drawing, white lead mixed with waste to be used as marking stuff.

The Conic Compass.

By Geo. B. Grant. Boston.

Various instruments have been invented for mechanically forming or drafting the circle, ellipse, parabola, and hyperbola. The common compass, or dividers, for the circle, the elliptic trammell for the ellipse, and the clumsy but simple devices by which either of the curves can be imperfectly drawn by the aid of a string and pins, are well known. But I am not aware that there is a known instrument that will draw either one of the curves, or that there is an instrument of reasonably simple and adjustable construction, composed of rigid parts, that will form either the parabola or hyperbola.

The instrument here described may be called the conic compass, because it will draw either of the conic sections, and in its arrangement and method of operation resembles a common compass.



The Conic Compass.

The instrument is founded on the theory that a conic section is the figure of the intersection of a circular cone and a plane.

A pencil P Q is so held that as it revolves it always represents an element of a cone with vertex at O, and its two points P and Q will always be in the surface of the cone. The paper represents the intersecting plane, and the line traced by the pencil on the paper must be the intersection of the plane and cone.

The stand H has a sleeve fixed adjustably on it at the joint J, so that it can be fixed at any axial angle O B D. The rod K is free to turn in its sleeve, but is longitudinally fixed in it by the adjustable collar L. The sleeve R is adjustably fixed on the rod K, so that it can be set at any conical angle B O P. The pencil rod S slides in the sleeve R, and the pencil points are in a line P Q that intersects the axial line A B.

To use the instrument, turn the rod K and keep the pencil point P on the paper.

If the axial angle O B D is set to a right angle, the pencil will trace a circle C; if the axial angle O B D is greater than the conical angle B O P, an ellipse D P will be formed. If the axial and conical angles are equal, a parabola will be traced; and, if the conical angle is the greatest, one pencil P will trace one branch F of an hyperbola, and the other pencil Q will draw its other branch G.

The instrument will act with theoretical precision if the parts are nicely made and mounted, and the only exact requirements are that the rods S and K shall move freely in their sleeves without shaking, and that the lines A B and P Q shall intersect. Inaccuracy in other respects will affect the position of the curve on the paper but will not affect its form.

This instrument will be the well known elliptic compass if the rod S is fixed in the sleeve R, and the rod K is free to slide in its sleeve; but it will not then draw the parabola or hyperbola.

Graduated arcs at the joints O and J, and a heavy stand H, would make the instrument more useful. The engraving shows the instrument in its simplest condition.

If the pencil rod P Q, is set at right angles, with the rod K, both branches of the hyperbola will coincide in the straight line X X.

Compound Engines for Stationary or Factory Purposes.

FOURTH PAPER.

By William H. Hoffman.

Factory engines, as a rule, are now over 100 horse-power in capacity. The high speed spinning frame requires more power than the old slow-motion machine, and the main line shafts in cotton and woolen mills that were formerly speeded at about 175 revolutions per minute, now run at 250 and 350 revolutions, so of course these conditions call for additional power from the prime mover.

Now in the manufacturing States, where anthracite coal is most used, the mill owner must have an economical engine if he intends to bring all the detail of manufacturing to a minimum cost, for, as I have just stated, factory powers are nearly all above 100 horse-power, and many of them run into the thousands.

The average price per ton of anthracite coal trimmed in the bins, is about $4.70 in cargo lots.

An engine requiring a consumption of three pounds of coal per horse-power per hour, when the total is 1,000 horse-power, represents an expenditure of about $70 for every ten hours for fuel, or in round numbers, including waste, $24,000 per year.

A first-class, well-proportioned plain condensing engine will reduce this cost to $17,000 per year, and a well-designed *compound* engine will still reduce the expense for fuel to $12,500, this consumption being about one-half that of the average factory engine as we find it to-day.

I said in a former paper that it was of little use to compound an engine unless we could have from 90 to 100 pounds as an initial steam pressure.

Our plate steel makers are furnishing an excellent material for boilers, and 120 pounds is a safe pressure for factory boilers of a diameter of 80 inches, and a length of 17 feet, each rating as 380 horse-power, calculated on a consumption of $16\frac{1}{2}$ pounds of water per horse-power per hour, and this will be the working duty of a *properly* constructed compound engine.

The boiler as above would have 44 square feet of grate, and 2,000 square feet of effective heating surface; the natural draught consumption being about $14\frac{1}{4}$ pounds of coal per hour on each square foot of grate, and *two* such boilers would comprise the plant to furnish steam for the engine I will here describe. *The secret of economy in a generator is compactness.*

We began at the grate bars, and will now pass on to the initial cylinder of a compound mill engine, receiving steam from the boilers at 115 pounds pressure; the combined high and lower pressure cylinders to develop economically 760 horse-power; the speed of the piston shall be 700 feet per minute, and the revolutions 110 per minute, so our stroke must be 39 inches.

I have found the minimum amount of cylinder condensation where the diameter was $\frac{66}{100}$ the length of the engine's stroke, so we will fix the diameter of our high pressure cylinder at 25 inches.

From this cylinder we shall get, at an economical point of cut-off, 380 horse-power.

Our low pressure cylinder will be $3\frac{62}{100}$ times the area of our high pressure cylinder, or 47 inches in diameter, and from this cylininder we shall get, after leaving a terminal of eight pounds to escape to the condenser, also 355 horse-power, making a total of 380 horse-power.

When I say that I consider the minimum of condensation is reached on cylinders whose diameters are $\frac{2}{3}$ that of their strokes, I mean that this has been my experience, all things considered.

Some one may say, why not make the stroke still shorter, and increase the number of revolutions. This idea would be correct in one sense, but there is one very important factor that stands in the way of *very* short strokes and high rotative speeds, and this factor is *clearance*.

Take, for instance, any modern engine with a piston and valve clearance of 2 to 4 per cent. of the displacement, running at 60 revolutions and 400 feet of piston travel per minute, and increase the revolutions to 120 and the piston speed to 800 feet, and the clearance has increased to double the former amount per minute. In *this* case, however, the displacements are also increased, because we have retained the same *stroke*, therefore the percentage of clearance to the piston displacement is the same in both cases.

Now for our other example; we will reduce the stroke of our first engine so that its speed will be 120 revolutions instead of 60, the speed of the piston remaining at 400 feet per minute.

At 60 revolutions and 400 feet our engine had 120 clearance points per minute, but at 120 revolutions we will have 240 clearance points per minute, both piston travels per minute being the same, so of course we have doubled our clearance relative to *displacement* per minute.

But most of our high speed engines make up this loss by the movements of their valve gear, bringing the compression of the exhaust steam near the end of the stroke, to a point that fills the clearances to a pressure of over one-half that of the initial.

Thus they arrest the momentum of the reciprocating parts, and reduce the clearance in effect to nearly that of the slow speed engine, while the *cylinder condensation* rapidly disappears under these conditions.

We will now consider the proportions of the main shaft and driving pulley.

At 110 revolutions with a *single* crank, that is to steadily transmit 760 horse-power, we should allow a diameter that would give us $6\frac{8}{10}$ horse-power for each revolution, and from the best rules and practice we find that $10\frac{1}{2}$ inches will be amply strong as far as torsion is concerned, but as I prefer absolute safety in this essential detail, I should make this main shaft $11\frac{1}{4}$ inches diameter at the journals, and 13 inches at the center, in order to safely receive the weight of the driving pulleys or drums and the stress of the belts.

The journals would be $1\frac{3}{4}$ times their diameter in length, or $19\frac{1}{2}$ inches, the side boxes being *divided* at the center of their length. Fixing our main belt speed at 3,700 feet per minute, our driving pulley or drum will be 11 feet in diameter, and according to my experience every inch in width of a good double belt at this speed will transmit $8\frac{1}{2}$ horse-power, so we will prepare our drum for three 28-inch belts, running about 4 inches apart.

The pressure on our main journal will be at the maximum 110,000 pounds, or about 500 pounds per square inch, so we are perfectly safe at this point.

I will now say that this proposed factory compound engine would be of the horizontal tandem type, one cylinder placed behind the other, both pistons being on one piston rod, as the low pressure piston will have a wrought iron center and head plates, it will be very light, the weight of both pistons being amply provided for.

As a matter of convenience in repairing I should place the low pressure at the rear, as then high pressure piston can pass through the front low pressure cylinder head, should it be necessary to remove the pistons.

There would be an independent air-pump running slowly, thus performing its full displacement duty, with the least possible amount of friction.

An engine of the proportions named, and running at the speeds specified, will develop on an average a horse-power with $1\frac{62}{100}$ pounds of anthracite coal per hour as a steady day's work.

The cost of such a plant would be about as follows: Boilers erected and connected throughout, $5 680; engine and piping complete, workmanship of the *best* order, $7,900; foundations, $1,200; total, $14,780. I call this a fair estimate, and think that any fair-minded mill owner will say that the compound engine for his work is worth investigating at least, for the present consumption of fuel for 760 horse-power represents $15,000 per year, while the properly designed compound machine will do this work at a cost of *not over* $8,800 per year, the new compound plant would pay for itself in about two and a half years.

LETTERS FROM PRACTICAL MEN.

Machine Shop Time and Cost Accounts.

Editor American Machinist:

I have read Mr. Shaw's and Mr. Metcalfe's articles on Methods of Keeping Costs, with a good deal of interest, because it is an subject I have given considerable thought for the last eight years.

In 1877, I found myself at the head of these shops with no records of costs and a large variety of "jobbing" and stock jobs to keep track of and make prices for, and worse than all, the foreman and hands were not educated to do so beyond the antiquated slate and a good guess, hence I felt very insecure, and the necessity of developing some practical and correct method.

These facts led me, very soon, to adopt the time slip and cost book method, as presented herewith, and though I do not claim it the best that can be devised, I do claim it works very well in shops of our size and character, employing from 150 to 200 hands, and doing, besides our regular work, a large amount of jobbing and repair work.

Let me say first, however, that I do not think any safe and true method can be devised that does not require a careful cost clerk and competent foreman, which means office labor, and while the check book system may answer for many large shops, yet in ours it would involve more time and annoyance than the one we use.

The system I propose to explain begins and ends in the offices, where all cost should. The orders being entered and indexed in an order book, each one has a number given it and a loose "shop order" made as a blank, bearing the same number which the job carries through the shop.

COHOES IRON FOUNDRY AND MACHINE SHOP.

Shop Order.

No. 2568. COHOES, April 1, 1886.

On acct. of Richard Roe, Holyoke, Mass.

One two ton elevator with automatic hatches and steel worm, and bronze gear, as per accompanying specifications.

This is correct, F. G., entry clerk.

Date of delivery, April 25. 8756 lbs.

Remarks—Erected by F. Clute, shipment delayed two days by snow storm.

Foreman, Jerome Garland.

This slip must be returned upon completion of order.

The original being on file in the office, this "shop order" and specification in detail go to the foreman, who gives out the job to the different departments on slips as indicated in foundry order.

FOUNDRY ORDER.

No. 2568. Date, April 2, 1886.

On account of Richard Roe,

One complete set castings for two ton elevator pattern, except worm and gear.

One spider for bronze gear.

Two sets 20″ friction clutch driving pulleys.

Castings, 5023 lbs.

Signed, Jerome Garland, foreman M. S.

Countersigned, J. W. Burnham, foreman foundry.

Returned April 6th.

A similar slip is also issued to the foreman of the wood shops with necessary details and drawings, and the machine work is allotted to the machinist.

As the work progresses each day, those working on the said elevator, except in the foundry, return to their foreman a "time slip."

These slips being assembled every morning and vouched for by the foreman, are carried to the cost clerk—who makes the usual entries in *cost book first*—and afterward in the time book.

Now our cost book is something we feel proud of (pardon our pride), because it is our own "crow." The headings and a few lines are given, which will give the idea.

To the total cost of "labor" and "material" is added, of course, a well determined percentage for incidentals and profits. At this point I must say the said "incidentals" do not decrease as fast as the said "profits," the latter being run at a very low figure, almost equalling the per cent. of interest on U. S. bonds.

I think I can hear a chorus of older men than I am, and with much more experience, singing, "Too fresh, young man," "too slow." "It may do for the Mikado or England, but for us No!" To which I would respond that it has been weighed and no

FOUNDRY TIME SLIP.

Cohoes Iron Foundry and Machine Co.

COHOES.....188..

I have this day worked—	Hours.	Min.	
In Foundry.....			
.....			
Total hours.....			

And made good castings .....lbs.
" " bad " .....pieces.
Total number of flasks .....
Remarks:
.....
Signed.....
This is correct.....Supt.

N. B.—To receive credit for your work, this slip must be filled out and handed in each night.

DAILY REPORT OF FOUNDRY WORK.

Cohoes Iron Foundry and Machine Co.

COHOES.....188..

Cupola Charges:

.....lbs. sprues.
..... " .....pig iron.
..... " ..... "
..... " ..... "
..... " ..... "
..... " .....scrap.
..... " coal.

Fire lighted.....o'ck.
Wind on.....o'ck.
Bottom drop'd.....o'ck.

Delivered:

.....lbs. cast iron.
..... " "

Received:

.....Foreman.

TIME SLIP.

Cohoes Iron Foundry and Machine Co.

COHOES, Apl. 5th, 1886.

I have this day worked—	Hours.	Min.	No. of Order.
For Elevator.....	5	30	2,658
Engine	3	00	2,641
Cutting 12″ gear for T. Jones.	1	30	2,647
.....	.....	.....	.....
Total hours.....	10	00	.....

Materials used:
No. 2,658; 73 lbs. bronze.
.....
Signed: P. JACKSON.
This is correct. JEROME GARLAND, Foreman.

N. B.—To receive credit for your work, this slip must be filled out and handed in each night.

found wanting, and a "cost" that does not cost accuracy and labor is good for nothing, and cannot be depended on.

Too many "jobs" are taken, by so-called practical men, at a "lump" price, the cost of which never has been kept, nor will be. One of our competitors only this week offered to make some friction clutches at a price he *guessed at*, and it was fully 25 per cent. less than our cost books show the mere cost for labor and material.

This system can be sub-divided to show the cost of *parts* of a machine, if it is desired, thus in the elevator, as above, if the cost of the crab or car or erection is wanted separately the order would be sub-divided, and these order numbers given to it, hence it is an elastic system and covers a large or small job.

"Our" system would not be complete, nor the description of it, if I did not cover the foundry labor and costs also, including the brass foundry; it is similar to the machine shop system, but not so elaborate. Each moulder has a package of "foundry time slips" that are returned every morning after being certified to by the foreman of the foundry, and his hours and pounds are entered in the time book. So the value of each moulder's work can be determined at a glance. The foreman also makes his return with the time slips of "daily report of foundry work" from which the charges to individual accounts are made, and the production and cost of each day's work in the foundry are duly recorded.

All of these various slips are gathered daily and bound together with brass pins and filed away in boxes, so that at any future time they are accessible—the *original* entries—to settle disputes with either customers or workmen.

There is a large item of laborers and repairs that cannot be charged to any job, and these are carried to the cost book account headed "Repairs" and "Laborers." These accounts are charged up and become a part of the incidental expenses of the business.

I do not know that I could suggest a more elaborate plan, but I don't think a more accurate one could be devised, and that is what we want.

I would suggest in closing if some of the close bidding machine shops would adopt a similar plan, and find out what their work is costing, there would be less bankruptcy in our guild, and better profits.

WARREN T. KELLOGG, Manager.

Order No. 2,658. Cost of elevator..... for Richard Roe.
Date Apl. 1st, 1886.

Labor	Material	April							Labor				Material			
		2	3	5	6	7	8	9	Total	Price	Amount		Total	Price	Amount	
	Cast iron..	9	..	50	5023	....	42	....	Lbs. 5124	3c.	153	72	.....	.....	.....	.....
	Bronze	..	4	...	73	....	....	2	79	25c.	19	75	.....	.....	.....	.....
P. Jackson.	.....	10	7	5.30	4	2	6	10	.....	.....	.....	.....	44½	25c	11	13
M. Cary ...	.....	10	10	10	10	10	5	....	.....	.....	.....	.....	55	20c.	11	00

Belt Transmission.

Editor American Machinist:

Will you please allow me to answer J. S. L's question in your issue of May 8, concerning the efficiency of a 20″ double belt, being driven by a 60″ pulley, turns 160, belt perpendicular.

I have successfully transmitted 100 horse-power from a 46″ pulley, 18″ double belt, distance between centers 28′, perpendicular travel 1,685′ per minute, 30 horse-power additional being added for two hours each day, the belt being the best parts of two condemned ones, having been previously used for the same purpose on smaller pulleys, unsuccessfully.

As A. S. L's belt is a 20″ and supposed to be in better condition than my overworked and strained one, also having a travel of about one-half more, with other gains which accompany large pulleys, and allowing mine to have but 100 horse-power strain, which I considered safe, figures will show that his belt is capable of transmitting more safely than mine accomplished its work, 167 horse-power.

To allow the additional proportionate strain of two hours we have a possible 217 horse-power.

Now these are simple facts showing what has been done, and as the basis of all methods for calculating the efficiency of belting comes from practical tests, this brief article may be of interest to some. I do not advocate working belts to their utmost capacity, but the question was, "What power will it transmit?"

A PRIORI.

[There is no reason to doubt that the power named by the writer could be transmitted by the belt named. Our answer was that thebelt would comfortably transmit about 60 horse-power, and this answer was given from considerable every-day experience with vertical belts. A boiler will withstand a pressure much higher than it is worked at, and in machines of all kinds a liberal margin of safety is allowed. Our experience with vertical belts leads us to believe that the margin given is not any too large. We would not attempt to say what power it would be possible to transmit with such a belt. No one knows this.]

Keeping Time Cards and Shop Order Cards.

Editor American Machinist:

I think that Mr. Burton, in your issue of May 8, has misunderstood my "check book" described in yours of April 24. In my plan also the orders are conveyed by tickets containing all necessary information; but it carefully avoids the combination of order ticket, time record, and material record shown in Mr. Burton's paper, because by making these three items independent of each other, they may all be treated separately and combined at will.

For example, the order may be given singly on a ticket to each man, or to all men by a bulletin, while in Mr. Burton's plan each man drawing pay on an order must have that order copied for him.

The time cards (coupons) are made out daily and are taken up nightly, and from them the pay roll is made out. Thus any error in the time cards is discovered and settled on the spot, and the pay roll and time cards must agree from the very start.

It seems to me that in a long job some of Mr. Burton's cards might be in the shops for months, when adjustment with the pay roll would be difficult.

I can imagine also the capacity of a card exhausted by frequent entries on protracted jobs. In having a card large enough for all jobs it becomes too large for some, so I prefer to use but one card at a time, and many of them, on the principles of building bricks. The same criticism applies to the entries of material, the names of all kinds of which can never be provided for on one card. I consider a fresh card and a fresh start essential.

I do not wish so much to criticise as to suggest what seems a better method of the same kind. Mr. Whitehouse, of Corrientes, Staffordshire, England, writes me the details of a plan much like Mr. Burton's, which he has long used with advantage. He has accumulated over one-quarter million cards, any one of which he says he can find as easily as if he had only twelve.

HENRY METCALFE.

Matthew Diamond.

We learn with deep regret of the decease of Matthew Diamond, at Watertown, New York, where he had recently taken up his residence. Mr. Diamond was for some years in the steel trade at Hartford, Conn., and afterwards held a position with the John Stephenson Company, of New York, builders of street cars. Later he was in the drop forgings business in Flushing and Brooklyn, N. Y. He was a thorough mechanical engineer, and a gentleman who never forgot any of his friends, of whom he had a large number.

MINNEAPOLIS INDUSTRIAL EXPOSITION.

One of the arguments of the prison contractors, who make cheap steam engines in the Minnesota State Prison at Stillwater, is that their product is almost all sold in the East, and does not therefore injure mechanical industries in the State. Similarly the the contractor who has 900 convicts in Sing Sing prison making stoves, claims that their labor does not depress the wages of free moulders in the State of New York, because he sells most of his product in the West. Prison contractors in other industries and in other States are ready to give figures about the number of workmen in their branch of business in the State, and to point out in the same facile way that their prison competition is but a small part of the whole. As the Constitution of the United States provides that there shall be no laws to restrict commerce between the States, it is evident that injuries to particular trades will be felt just as much outside of the State where they are inflicted as in the State. Injury caused by the prison contract system will react, and the only way to prevent it is to abolish the convict contract system in every State. The sooner this is done the better.

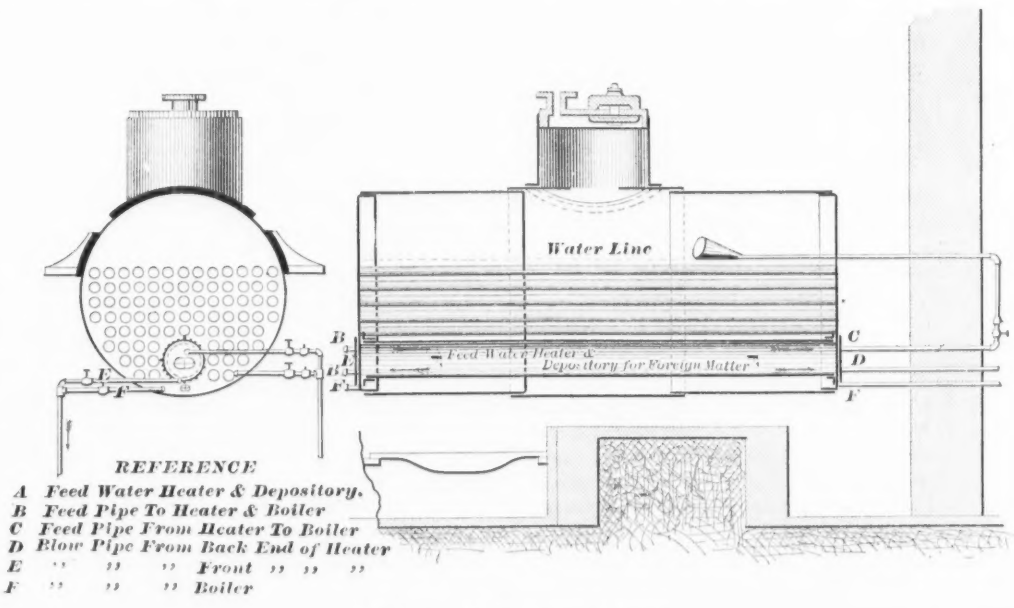
Reynolds' Feed Water Heater.

The engraving represents the invention of T. J. Reynolds for the above purpose. As will be seen it consists essentially of a shell or casing in this instance a large tube inside and is near the bottom of the boiler shell. Into this tube the feed water passes, at one end, and is discharged into the boiler from the other end. Owing to the size of this pipe the water has a sluggish flow, and will be heated up to the temperature due the pressure in boiler; and hence will deposit foreign matter set free at that and lower temperatures in the bottom of the tube or heater. Blow pipes, as shown, are provided, one at each end of this tube. When it is desired to thoroughly clean this tube, the feed pipe is closed, then steam is admitted from the boiler through one blow pipe, as *E*, and the contents of the tube blown out at other pipe *D*.

In the engraving, the heater tube is shown applied to a new boiler, in which provision is made for its application; for old boilers, a somewhat different manner of application is adopted.

In addition to steam boilers, the arrangement is designed to be applied to oil stills and other evaporating vessels, for the purpose of depositing foreign matter before the liquid passes into the evaporating vessel.

The manufacturers are Francis Nolan & Company, 300 Fourth street, Brooklyn, E. D.



REYNOLDS' FEED WATER HEATER.

The New Minneapolis Industrial Exposition.

The people of Minneapolis decided some months ago to have a first class industrial exhibition, and with the enterprise characteristic of the citizens of that place, immediately organized an exposition association and proceeded to gather up a cash capital of $300,000 and to secure a building site as the contribution of the city itself, worth $200,000. The next thing was to erect a large structure in which to hold the exposition. The engraving herewith shows the building which is now being erected.

It occupies a commanding site overlooking the Falls of St. Anthony, within less thanhalf a mile of the business center of Minneapolis. The building is 366 feet square, with streets and open spaces on every side, and is at the base of the walls about 50 feet above the river. Thence the walls rise 80 feet to the cornice, while the top of the dome is 144 feet. The corner pavilions are each 128 feet high, and the great tower on the corner of Main and Bank streets is 40 feet square and 160 feet in height to the first balcony, with accommodations for 400 people, and is reached by an elevator. There is an upper pavilion 200 feet from the ground and above that the spire and electric mast, supporting a ring of lights 260 feet above the level of the street.

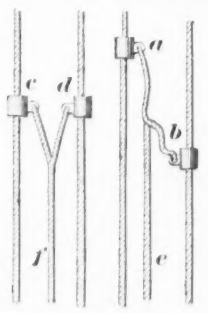
Pink Mankato stone and red brick form the material for the structure. The rules and regulations governing exhibits have been published, and can be obtained by writing to the association. No charges made for space or power. Price of admission, 25 cents. Machinery will constitute the main department of the exposition, which is divided into 18 classes. Altogether there are 8 departments and 103 classes.

The exposition will be open for six weeks from August 23 to October 2, daily, except Sunday.

This exposition affords an excellent opportunity for the manufacturers of mechanical articles of every kind to show their goods to the people of the Northwest. We learn that applications for space are being received very rapidly from all sections of the Union.

Elevator Stop.

A handy rig for stopping an elevator at any point, either while going up or down, is shown in the engraving. It consists of two short ropes *c* and *d*, which are attached to a long rope *f*, extending to the bottom of the elevator well, or to the first landing.



The device should be attached above the upper landing. When the elevator is started, the device occupies the position shown by *a* and *b*. When it is desired to stop, by pulling the rope *e* the cords are brought in to position shown by *c* and *d*.

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☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, MAY 22, 1886.

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Mailing Samples of Small Tools and Specialties to Foreign Countries.

We are indebted to an enterprising firm in Philadelphia, manufacturing small tool and hardware specialties, for the information that the United States Government, by the recent practice of the Post Office Department, is now making a much more liberal interpretation of the treaties establishing the International Postal Union, than was formerly the case. The clause affected is that relating to the terms under which electrotypes for advertising purposes and samples of merchandise can be sent to foreign countries through the mails.

The strict letter of the treaty laws stipulates that samples of merchandise so sent shall be such as have "no salable value," and the difficulty has been to properly and uniformly interpret this clause so far as differing "sample" articles, offered for transmission abroad through the mails, are concerned. In some cases it has been deemed necessary to mutilate the sample in order to make sure that it should have "no salable value." Unfortunately articles so treated were usually as valueless for sample purposes as for use.

The postal officials of European countries, embraced in the Postal Union, have not been in the habit of taking so strict a view of the clause relative to "salable value," and consequently have been in the habit of freely forwarding samples of merchandise through the mails to this country whenever the privilege could reasonably be afforded, and the receiving departments of American post offices have usually allowed such articles to be delivered to the consignees, of course on payment of the proper customs duty, if dutiable. It can hardly be doubted that many important sales of such merchandise have resulted to foreign manufacturers from the facilities thus afforded them for forwarding "samples" to this country. For example, a foreign manufacturer of files, or table cutlery, or egg-beaters, or small tools, could conveniently send through the mails samples of his wares to American importers, or to his agent in this country, as well as electrotypes intended for use in preparing circulars describing the same. It should be noted that, in the case of many such small articles of merchandise, this method of making sales is the most available method of introducing new specialties.

In contrast to this liberal method of dealing with foreign manufacturers, American manufacturers of similar goods, being held to a stricter rendering of the same laws, have not until recently been allowed equal privileges in the matter of sending samples to foreign countries through the mails. Postal officials who felt willing to take a reasonable view of the "salable value" clause, have usually not dared, and sometimes have not cared to do so.

When American manufacturers offered "sample" articles to the forwarding departments of American post offices for transmission abroad, the officials receiving them, have usually felt bound to place a very strict interpretation upon the law regulating these matters, frequently following the letter of the law to the violation of its spirit.

The same treaty laws have thus, in an important particular, been construed by American postal officials to the advantage of foreign manufacturers, and to the disadvantage of our own. It is needless to say, that, as a consequence, many sales which American manufacturers might have made in foreign countries, possibly aggregating large amounts, have not been made, a result detrimental to the interests of both employers and employed.

We are glad to learn that the practice heretofore followed by American postal officials has lately been greatly liberalized, and that such articles as single files, table knives, and many other manufactured articles intended strictly for use as "samples," may now be conveniently sent to foreign countries through the mails. Such articles as pocket knives, which are usually sold singly, and therefore are held to have some salable value, can be sent abroad at letter postage rates. Electrotypes intended for use in preparing circulars and for other advertising purposes, can be sent abroad at letter postage rates, except to Canada, to which country they cannot, as the law and rulings now are, be sent through the mails even at letter postage rates. It would be interesting to know whether Canadian manufacturers, desiring to mail similar electrotypes to this country, are held to the same rigid ruling.

We are glad to find American postal officials interpreting the provisions of the Postal Union treaty laws in the same liberal and reasonable way that has long been followed in European post offices. No postal official or forwarding clerk should have reason to fear discharge or reprimand, because occasionally objection is made abroad to the character of a "sample" article of merchandise received and forwarded by him. Our Government and its subordinates should, in all reasonable cases be disposed to give the benefit of the doubt to American manufacturers, who desire to find foreign markets for American tools and other manufactured specialties.

The Value of Business Integrity.

The value of well-established business integrity was never better exemplified than it is just now in the machinery business. Buyers expect to buy for little money, but quite as much they are interested in getting exactly what they bargain for. There is every reason why this should be so. No man ever considers anything cheap, in any sense of the word, which is not what it is represented to be. Sharp practice may succeed for once, but not again in the same direction.

Some builders of steam engines are remarkably busy, having secured orders in spite of lower figures by others in the same line of engines, because their reputation for honest work is undoubted.

In times of low prices and slack orders, the temptation is to build cheap for the sake of naming low prices. At the best this can only secure temporary advantage. In the end those who deliver exactly what they sell, maintaining their character for honest work, will take the orders at fair living profits. No one likes to be humbugged in buying machinery.

In many cities during the past five years strong efforts have been made to force into use, in steam boilers, some kind of a furnace to prevent smoke. There is probably some virtue in many of these furnaces, but their use has brought out the fact that after all the best smoke preventer is a good fireman. Between a good furnace and a poor fireman, and an ordinary furnace and a good fireman, everything is in favor of the latter. This is only one of the many instances in which men go by and around simple means to accomplish an end through many complications.

Manufacturing Needs.

The need of providing rapid means of manufacture was never so great as at present. Not so much because rapid manufacture in a general sense is a necessity, but rather that the keenness of competition demands it in any particular instance. War was prosecuted about as successfully one hundred years ago as it is now, but the nation that clings to antiquated methods has feeble prospects in disputing with those that employ modern means. So in manufacture; the fact that one manufacturer uses the most approved appliances makes their use by all imperative, and doubly so in times of close competition. When manufacturers are satisfied only with large profits, then those who work with inferior facilities may squeeze along. It is then a question of more or less profit. But when everyone is satisfied with small profits, the best of appliances must be used to compete. Smaller profits than ever before are accepted to-day, and the possibility of success is almost surely compassed by the character of the facilities for manufacture. The difference in the efficiency of these facilities need not be very marked to amount, in effect, to more than the margin that the better equipped competitor is willing to accept as profit.

Cheapening the cost of maintenance of plant (which may sometimes mean cheapening the cost of production) by keeping in use machinery that ought to be replaced by that of modern design, will not answer when the difference between actual cost and selling price is only a few cents on a dollar.

The times are certainly not favorable to the continued existence of the poorly equipped shop or factory, no matter how cheap the cost of equipment. The interest on the cost of better equipment is small compared to the better and more rapid production of the improved tools and machines. Fortunately, however, the cost of improved machinery is extremely low. Machine shops and factories that do not now put themselves in shape for close competition are never likely to find so good an opportunity as the present.

Literary Notes.

MECHANICS AND FAITH. A STUDY OF SPIRitual Truth in Nature. By Charles Talbot Porter. New York and London: G. P. Putnam's Sons.

We have received a copy of this book from the publishers, and have read it through slowly and with some care as well as interest. The book mainly deals with problems of speculative philosophy, which, when well handled, are of absorbing interest to many persons, but the discussion of which lies outside the scope of a mechanical newspaper. The book treats many portions of its theme in a way not greatly differing from that employed by more than one writer. The peculiarity of the book, as hinted, but not expressed, in the title, is that it purports to treat the problems to which it relates, not from the standpoint of the professional philosopher, the botanist, the physiologist, or the theologian, but from that of the working mechanical engineer. The book will not escape criticism, and will, we think, be found worthy of critical examination. It will not entirely please any of the opposing camps into which the philosophical and religious world is divided, but it will be likely in time to command attention. The book is clearly printed, and is written in a concise, forcible style, though we think a system of side notes or headings on the pages would have been of value to readers. The book contains nearly 300 pages; the price is $1.50.

Not with view to explain the purpose of the book, so much as to illustrate something of the standpoint from which the book was written, we copy elsewhere some specimen passages taken from the earlier pages.

The annual statistical report of the American Iron and Steel Association has just been published in pamphlet form by the association, 261 South Fourth street, Philadelphia. It contains complete statistics of the American iron trade for 1885 and previous years, and a brief review of the present condition of the iron industry in foreign countries. The following table shows the production of iron and steel in the United States for the years 1884 and 1885:

PRODUCTS.	Net Tons. (Except Nails)		Increase or Decrease per cent.
	1884.	1885.	
Pig iron	4,589,613	4,529,869	− 1
All kinds of rolled iron, except rails	1,931,747	1,789,711	− 7
Bessemer steel rails	1,116,621	1,074,607	− 4
Open-hearth steel rails	2,670	4,793	+80
Iron rails	25,560	14,815	−42
Kegs of iron and steel cut nails	7,581,379	6,696,815	−12
Crucible steel ingots	59,662	64,511	+ 8
Open-hearth steel ingots	131,617	149,381	+13
Bessemer steel ingots	1,540,595	1,701,762	+10
Blooms from ore, pig iron and scrap	57,005	41,700	−27

We welcome the *American Manufacturer*, of Pittsburgh, to our exchange list. Joseph D. Weeks, who was editor of that paper ten years ago, and who has been associate editor of the *Iron Age* during the whole decade, has taken his former position. He retained his stock interest in the *American Manufacturer* during his absence from the editorial chair. Mr. Weeks is an active, incisive

and progressive editor. As a collector of reliable information about the iron, steel, glass, coke and coal trades, he has no superior in this country. The report of the United States Census for 1880 contains the results of much of his work in gathering statistics of certain trades. Under his direction, the *American Manufacturer* will doubtless be the leading authority on matters of general import and of current interest in the iron and steel industries.

PRACTICAL TREATISE ON GEARING. By Brown & Sharpe Manufacturing Company, Providence, R. I.

If a mechanic attempts to study the subject of gearing with such light as he will be able to get from the majority of text books, he finds an amount of investigation necessary which calls for more time than he is prepared to give to a single subject; that is unless he proposes to devote his time principally to this branch of the business. At the same time there are few mechanics that do not at some time have occasion to consider transmission which involves the use of gearing.

Anything, then, which will simplify the subject in a way to convey the information the mechanic needs, without leading him through investigation, which he has no time for, should be hailed as a valuable acquisition to the mechanical literature of the day.

This book seems to fulfill this requirement in a very happy degree. The preface is so short, and so much to the point in showing the intention of the writer, that we copy it entire:

"This book is made for men in practical life; for those who would like to know how to construct gear wheels, but whose duties do not afford them sufficient leisure for acquiring a technical knowledge of the subject."

In looking through the work the impression is strong that the author—reversing the usual practice—first wrote his preface, then taking it for a text successfully curbed any inclination to depart from it. Definitions are always clear and concise, and it is a pleasure to follow the directions for determining sizes, velocities, etc., and for laying down lines. The book is well-printed, excellently illustrated, and in addition to the information on gearing, contains incidentally, much other information of use to the practical mechanic. The price of the book is $2.10, post paid.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

---

(208) D. J., Christiana, Pa., asks: 1. In cutting a thread on a pipe tap should the tool be set square with center line through tap, or square with the tapered portion? *A.*—We have several times answered this question to the effect that the thread should be cut at right angles with the axis. In one or two instances this has been questioned, which led us to refer the question to the Pratt & Whitney Company, who have very thoroughly investigated all questions relating to screw threads. They very courteously answer our inquiry as follows: "In cutting pipe taps we work from the axis or center line. All taper threads for general use should be cut at right angles with the axis, and not from taper surface." 2. Nothing can be told about the proper lap for valve for automatic engine without knowing more about the construction than you give.

(209) T. M., Little Falls, N. Y., asks: Will soda ash prevent the formation of scale in boilers, and remove scale already formed? *A.*—Soda will sometimes be of considerable use for this purpose. Its value will depend largely upon the character of the water used. Soda ash is not so good as the ordinary soda of commerce. 2. How much should be used in a ten-horse-power boiler? *A.*—Begin with a half-pound, and increase if it does not induce foaming, up to perhaps a pound, or even more.

(210) T. W. B., Christiana, Pa., asks: Would a connecting-rod, in which compensation for wear of boxes would take place as it occurs, be an advantage? *A.*—Yes; if it can be done as satisfactorily as by human agency.

(211) Engineer, San Francisco, Cal., asks: 1. In which case will the fire-box and the flues of a locomotive boiler be the hotter, when steam is rising and the engine is not working, or when the pressure is the same and the engine working? *A.*—We do not see that it is a question of whether the engine is running or not. It will be mainly a question of the intensity of the heat in the furnace, which may be greater or less, without reference to whether or not the engine is running. 2. Does ebulition continue under pressure, engine not working or only when engine is working? *A.*—If the engine is not working there must be ebulition if the steam pressure is rising, to supply the steam necessary to increase the pressure. With the engine working, if steam pressure remains nearly constant, ebulition must occur to supply the steam used by the engine. 3. Why is it that when we remove a tea-kettle from the fire, the water boiling, we can hold our hand on the bottom of the kettle without burning our hand? *A.*—So far as we have investigated this it is due to the non-conducting properties of the soot on the bottom of the kettle. If you will try it with a new kettle, we think you will not relish holding your hand on the bottom.

(212) X. Y. Z., Clifton, Arizona, writes: What is a safe speed at which to run a corundum wheel 16″ diameter by 2″ face? *A.*—900 revolutions per minute is a safe speed. 2. Is 1760 revolutions per minute too fast? *A.*—It is decidedly too fast for safety. That speed is sufficient for an 8¾″ wheel. We should not care to be in a shop where a 16″ wheel was running 1760 revolutions per minute. 3. Do you approve of putting a leather washer next the wheel, and then screwing the metal collar up to the same? *A.*—Leather will answer, but we prefer felt or canvas. 4. Is there any danger that a wheel with babbitt bushing, to fit spindle, will burst by expansion caused by grinding? *A.*—The metal bushing will not prevent bursting; but in case of such bursting the expansion is caused by heating of mandrel, not by heat caused by friction of work. The wheel should be slightly convex upon its sides, and the collars should be concaved to fit.

(213) H. J. M., Wilmington, Del., writes: 1. What kind of varnish is used on natural wood, or lead paint? *A.*—Any kind of varnish may be used; copal, demnair, and shellac are probably most used for that purpose. 3. What is the difference between a corundum and an emery wheel? *A.*—Emery and corundum are substantially the same, but corundum is generally applied to the coarser grades. 4. Will steel or iron rails last the longest on a single or double track, the same amount of work being done in both cases. *A.*—On a double track. 5. Will an air drum weigh more with 100 lbs. air pressure, than without? *A.*—Yes. 6. What is water gas? *A.*—Water gas is made by passing super-heated steam through and over incandescent carbon.

BUSINESS SPECIALS.

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Patent Att'y, H. W. T. Jenner, Washington, D. C.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Alt, Mechanical Engraver on Wood, 318 B'way., NY

T. M. Parker, Steel Stamps, Stencils, Hartford, Ct.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 48 Beekman st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Tack, Wire and Shoe Nail Machinery. Wm. A. Sweetser, Brockton, Mass.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Foot-power Machinery, for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Improved Labor-saving Upright Drills, 20-in. to 36-in., inclusive. Currier & Snyder, Worcester, Mass.

"Morrison's Practical Engineer." A complete treatise (200 pp.) on steam and general mach. Mailed on receipt of $1. W. A. Morrison, Box 373, Lowell, Mass

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

E. Merritt & Co., Brockton, Mass., established 1859, only manufacturers of a complete line of Tack and Nail Machinery. Send for circulars.

Curtis Pressure Regulators, Curtis Return Trap Curtis Damper Regulator. See May 1, p. 10. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-taught," $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Bound Volumes of the AMERICAN MACHINIST for the years 1880, 1881, 1882, 1883, 1884 and 1885. These volumes are strongly bound in cloth, and will wear well. Price $3.50 each; express charges additional. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

Wanted—Numbers 1, 2 and 4 of volume IV., 1881; must be in excellent condition for binding, if soiled we cannot use them; for copies described as above we will pay 25c. each, and prefer to have the whole three if possible. Parties favoring us will kindly write name and address on wrapper. AM. MACHINIST Publishing Co., 96 Fulton street, N. Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2, post-paid. For sale by John Wiley & Sons, 15 Astor Place, New York.

MANUFACTURES.

N. W. Russell is erecting a foundry on the corner of Clay and Polk streets, Vinton, Ia.

T. L. Smith, of Wausau, contemplate starting a foundry and machine shop at Reedsburg, Wis.

A co-operative stove manufactory is to be formed at Trenton, N. J.

It is reported that Northern capitalists will spend $600,000 in establishing car works at Norfolk, Va.

J. Wall will add a foundry to his machine shop at Greenville, Miss.

O. R. Rand will rebuild his machine shop at Goldsboro, N. C., recently burned

James Sheriffs, engine builder, Milwaukee, Wis., proposes to open a boiler shop.

The Lehigh Canal and Navigation Company contemplate purchasing the Allen Machine Works at Lehighton, Pa.

The American Tube and Iron Company, Middletown, Pa., will erect an extensive plant in Gibsonville, Ohio.

Newton Bros. will probably locate a pulp mill at Monroe, Mass., as they can have taxes free for five years.

It is reported that a company of Louisville gentlemen will establish an edge-tool factory at De Pauw, Ind.

The C. & E. R. R. have moved their shops from Batavia Junction to Portsmouth, Ohio, where they are fitting up machine shops.

An international movement is on foot to drive prison-made goods out of the markets of England and the United States.

It is reported that the contract has been let to erect water-works at Durham, N. C., to cost about $100,000.

Cole Bros. have purchased an old foundry and machine-shop plant at Parkersburg, W. Va., and are building a new foundry.

It is reported that large manufacturing works will be established at Irondale, Ala., by a Birmingham syndicate.

W. A. Plummer will, it is reported, fit up a building at Vanceburg, Ky., with machinery to manufacture grain cleaners.

The citizens of Cleburne, Texas, are making an effort to secure the location of the machine shops of the Atchison, Topeka and Santa Fe railway.

The Hollingsworth & Whitney Co., Gardner, Me., will build a 35-foot square machine shop in connection with their paper mill.

Several well-known capitalists are considering the matter of establishing an iron ship-building yard at Bath, Me.

A permit has been granted to the Wood Manufacturing Company, of Camden, N. J., to erect a worsted factory, 53x150, at Fifth and Erie streets.

The Air Line Machine Shops, at Huntingburg, Ind., are nearly completed, and a large force of mechanics will soon be transferred there from Jasper.

Presque Isle, Me., expects to have a machine shop. A stock company is to erect a building, and it is understood that E. Banfill, of St. John, will put in about $10,000 worth of machinery and tools.

The American Oil Co., of New York, have purchased a site at Charleston, S. C., for the erection of works to clean cotton seed for shipment to Europe.

T. Noble, South Eighth street, near Sixth, Brooklyn, N. Y., is about to erect four-story brick stores and manufactories, covering 42x70 feet, with a 20-ft. extension.

Orr & Sembower, Reading, Pa., have issued a pocket-size catalogue of their vertical, horizontal, and hoisting engines. It is well printed and illustrated.

The Memphis and Birmingham Railroad Co., incorporated in Alabama, has purchased ground at Birmingham for the erection of car shops, freight depots and an elevator. It is said that work on the road will commence within 60 days.

The Cincinnati Screw and Tap Company have issued a catalogue of their "Universal Milling Machine and Gear Cutter." Cuts of the machine and attachments are shown, also some outline cuts indicating how certain jobs are done on the machine.

The corporation that has been formed in Ashland, N. H., has purchased a mill site, and will erect a mill 111 feet by 54 feet. It will use the latest kind of machinery, and will manufacture hosiery and cardigan jackets.

At Beaver Falls, Pa., a co-operative planing-mill company has been formed among a number of practical mechanics, with a capital of $50,000. They have purchased the planing-mill of Wareham, Dodds & Co., and propose to fit up with the most approved and costly wood-working machinery.

E. E. Garvin & Co., 141 Center street, New York City, have already secured extensive appliances for manufacturing the Hammond type-writer, in lots of 5,000 each. They are now putting in machinery and men sufficient to double their capacity for manufacturing this machine.

Hamilton Disston, Rufus E. Rose, E. T. Steck and Samuel C. Headley have incorporated, at Kissimmee, Fla., the St. Cloud Agricultural and Improvement Co., capital stock, $100,000, to buy, sell, and improve land, erect sugar mills, build canals and railways, etc.—*Baltimore Manufacturers' Record.*

The Howe Scale Company, Rutland, Vt., has just received an order for 250 platform scales for the Argentine Republic for use by the Goverment in the military department. They are from 600 to 1,200 pounds capacity, and weigh from 100 to 140 pounds each. When not in use they fold up into a very compact form.

The Eureka Steam Heating Co., of Rochester, N. Y., have issued a very finely printed pamphlet descriptive of their boilers and radiators, together with a lot of testimonials from parties using them. The pamphlet is a novelty of typographic arrangement. Apparently the resources of a whole type foundry was utilized in its composition.

The Boston *Journal of Commerce* says: "Johnson & Bassett, builders of wool spinning machinery, Worcester, Mass., are building a new factory corner of Foster and Bridge streets, in that city. The new building will be of brick, 139 feet long by 62 feet wide, four stories and basement, and will be a model building in every respect."

The new co-operative foundry at North Dighton, Mass., is expected to be in running order about the first of June. The moulding shop is a one-story building, 80x50, and the setting-up shop a two-story building, 70x50. Fourteen moulders will be employed, and about ten other hands, at first, all of them being residents of North Dighton.

In our issue of Jan. 31, 1885, we illustrated and very fully described the Charter Gas Engine, then built by the Charter Gas Engine Co., of Sterling, Ill. Since then this engine has been changed, mainly in the direction of bringing the parts nearer together, making the engine more compact. It is now manufactured by the Williams & Orton Manufacturing Co., of Sterling. The inventor, Mr. Jno. Charter, is president of this company.

Mr. John Jarratt, ex-President of the Amalgamated Association of Iron and Steel Workers, and Mr. Andrew Carnegie, the millionaire iron maker, have in contemplation the organization of an immense co-operative store and bank, to be first established in Pittsburgh, with subsequent branches in many of the different cities and localities where there are large numbers of workingmen. The stock is to be taken by members of labor organizations exclusively, and no person will be permitted to take more than $200 worth of stock.

The Boston *Commercial Bulletin* says: "Warren citizens are excited over the report that the Knowles Steam Pump Company, which had everything ready for the building of a new brick shop within 60 days, had given up the idea because the railroad company has refused to build the spur track to the shop yards. The removal of the works from the town under the circumstances is not altogether improbable, and the business men are arranging for a public meeting to see if the pump company cannot be kept where it is."

The *Jeffersonian*, of Stroudsburg, Pa., in concluding a spread-eagle notice of the Tanite Co., concludes thus: "The Tanite Emery Wheel which makes the sparks fly in streams from the saws of Williamsport and Saginaw, sends out its comet-like streams also in the forests of Finland and Australia. New users from hitherto unreached places excite attention frequently. Among recent orders was one for Peru, in South America. It called for two dozen Tanite Emery Wheels to be used in smoothing the blanks from which silver dollars were to be coined."

The Co-operative Foundry Company, of Rochester, has been a financial success, though at least a partial failure as a co-operative enterprise. When it was established, nineteen years ago, all employes were stockholders, and profits were divided as follows: 12 per centum on capital, and the balance in proportion to the earnings of the men. But the stockholder was stronger than the co-operative brother. Dividends on capital were advanced in a few years to 17½ per centum on capital, and then to 25, and finally the distribution of any part of the profits in proportion to wages was discontinued. Money has been made, and dividends have been paid every year. Two years ago they amounted to 40 per centum on capital.—*Age of Steel.*

Machinists' Supplies and Iron.

NEW YORK, May 6, 1886.

The unsettled feeling during the past week, caused, probably, by labor troubles, still continues.

Iron—In American pig the market has been dull. The demand has shown no increase. Standard Lehigh and North River, $18.50 to $19.00; No. 1 X, Foundry, $17.00; Grey Forge, $16.00 to $16.50.

Scotch Pig—We quote Coltness, $20; Glengarnock, $19; Gartsherrie, $19.50; Summerlee, $19.50; Eglinton $17.50; Langloan, $19.50, and Dalmellington, $18.50.

Copper—Dealers who are making efforts to maintain prices find but little improvement in the market. Lake has sold in small lots at 11¼c.; other brands, 10⅜c. to 10⅝c.

Antimony—Hallett's, 8¼c.; Cookson's, 9¼c., with supplies steadily held.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Head draftsman, experienced in designing paper-making machines. Address Fourdrinier, care AM. MACHINIST.

Wanted—First-class die sinkers and drop forgers on general work. J. H. Williams & Co., 13 Richards street, Brooklyn, N. Y.

Wanted—Foreman to take charge of machine shop employing about 75 men. Address "James," AM. MACHINIST.

Wanted—Draftsman, competent and reliable, with experience on tools, hoisting machinery, turbines, mining machinery, etc., desires engagement. Address Box 9, AM. MACHINIST.

Wanted—A competent man to manufacture fulminate of mercury and load cartridge primers. State age, experience, etc., with expectations. Address, box 7, AMERICAN MACHINIST.

Mechanical engineer and draftsman wishes situation, or assistant, or in patent office; speaks German; best references. Address F., 186 Washington avenue, Newark, N. J.

First-class mech. engineer and draftsman, pract. and theoret., wants position; great experience here and abroad; fair education; can take charge of drawing room. P. O. Box 391, Taunton, Mass.

Wanted—A mechanical engineer of experience, to take charge of our mechanical department. Address, with references, U. S. Cotton Harvester Co., Room 68, Cotton Exchange Building, N. Y. City.

A first-class working machinist, who is capable of organizing milling mach. system on steam engine work, formerly done on shapers and planers; one who understands getting out the jigs, cutters, etc., necessary for this class of work; work to be done on three new machines of latest design. Address at once, P. O. Box 2132, N. Y. City.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Compound; ever reliable, never failing. Crescent Mfg. Co., Cleveland, Ohio.

Light mach'y of all kinds built at short notice. Pennington & Mills, 8 Dey st., Jersey City Heights, N. J.

Send for estimates of high-speed compound engines for stationary and marine service. Crist Engine Works, 140 Baxter street, N. Y.

Useful information steam users and engineers 100 page book on care, etc., of boilers. Send 25 cents in stamps. J. N. Mills Pub. Co., 30 Vesey st., N. Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

For Sale Cheap—State rights for patent nail holder, to hold in left hand. Address A. L. Wheelock, Buffalo, N. Y.

Boiler shop needed in a manufacturing town in New York State; excellent opportunity for a live man; advertiser willing to aid in securing orders. Address Box 8, AM. MACHINIST.

Wanted—A good firm of machinists to make a high-class positive water-meter; also an exhaust and live steam injector, which is simpler and better than any in the market, and is in great demand in Europe. Address Harry Olrick, 320 B'way, N. Y.

M. Martin, manufacturer, P. O. Box 285, New Brunswick, N. J., will contract for the manufacture of articles in brass and other metals (stamped or turned), and dies and tools for making same; also patent novelties, electrical inventions, special machinery castings, etc.; estimates cheerfully given.

Wanted—Pattern maker and draftsman, with $2,000 or $3,000, to take an interest in an established engine, saw-mill and boiler works, to work under salary; the entire plant is new equipped with the best tools; has been in operation 2 years; books will show a dividend of 25 per cent.; located in a fine Southern town of 10,000 inhabitants; has the best of prospects for future business; machine shop, foundry and boiler shop operated by practical men, who are stockholders, and all workers; references required and given. For further particulars, address South, care AM. MACHINIST.

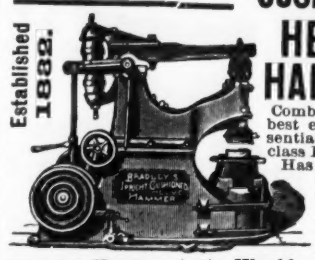
PATENTS THOS. P. SIMPSON, Washington, D.C. No pay asked for patents until obtained. Write for Inventor's Guide.

FOR SALE.

A Well-known Machine Shop in a Manufacturing City, NEAR BOSTON. Capacity, 30 Hands. Now MAKING MONEY. Death causes sale. Address,

EXECUTOR, care Am. Machinist.

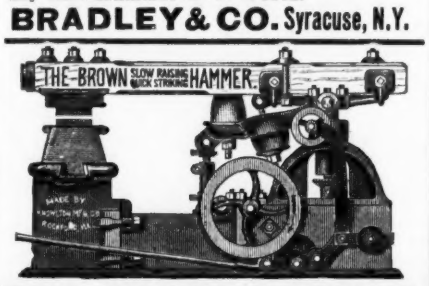
BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER



Established 1882.

Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the **World.**

BRADLEY & CO. Syracuse, N.Y.



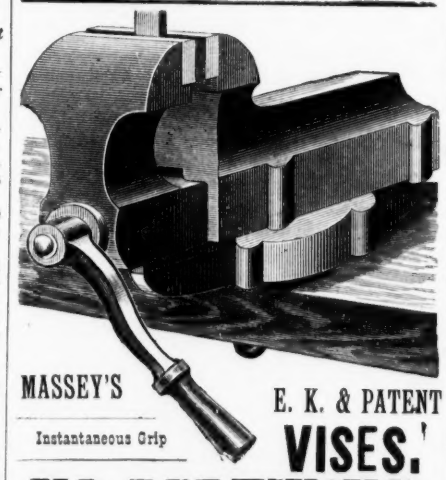
THE BROWN HAMMER
STRIKES A BLOW WITH
DOUBLE THE VELOCITY That it Raises The Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
KNOWLTON MFG. CO., King St., Rockford, Ill.

BEAUDRY'S UPRIGHT CUSHIONED POWER HAMMER.

By far the Best.
Blow Accurate.
Powerful and Elastic

Will Increase the Profits of any Shop.

BEAUDRY & CUNNINGHAM,
BOSTON, MASSACHUSETTS.



MASSEY'S E. K. & PATENT **VISES.**

Instantaneous Grip

NO SCREWING.

T. C. MASSEY,

Chicago. 81 John St., New York.

50 Per Cent. of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the improved taper, pipe and other attachments. Sold by the trade. Send for circular.

MELVIN STEPHENS, Prop'r, Office, 41 Dey St., New York.

FINE BUSINESS OPENING

For a Practical Machinist with a specialty to manufacture, together with general jobbing business. We have a well equipped Machine Shop with tools and power to lease. Our large foundry adjoining can be rented if desired, with a fair business assured. One year's rent and probably more could be paid in machine work. Some financial aid given if necessary, to responsible parties with moderate capital. Good references required.

HARRIS MFG. CO., Rutland, Vt.

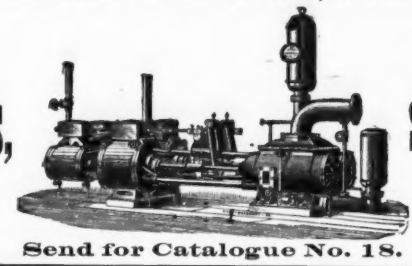
ANNOUNCEMENT!

We have just issued a new and very complete Illustrated Catalogue, which we will be pleased to mail to our patrons and others on application:

KNOWLES STEAM PUMP WORKS,
93 Liberty Street, New York,
44 Washington Street, Boston.

THE DEANE STEAM PUMP CO., HOLYOKE, MASS.

BUILD WATER WORKS, ENGINES AND STEAM PUMPING MACHINERY.



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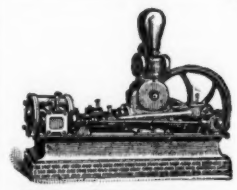
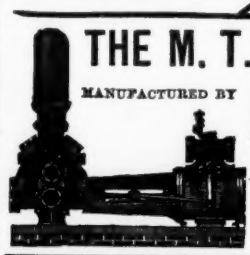


Fly-Wheel Pump.

GUILD & GARRISON,
BROOKLYN, N. Y.
STEAM PUMPS,
VACUUM PUMPS,
AIR COMPRESSORS.
NEW CATALOGUE NOW READY.

THE M. T. DAVIDSON IMPROVED STEAM PUMP



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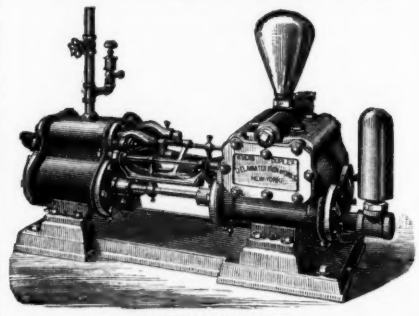
DAVIDSON STEAM PUMP COMPANY.
WARRANTED THE **BEST PUMP** MADE FOR ALL SITUATIONS.
PRINCIPAL OFFICE, No. 77 LIBERTY STREET, N. Y.
NEW ENGLAND OFFICE, 51 OLIVER STREET, BOSTON, MASS.

DELAMATER DUPLEX STEAM PUMPS,
FOR ALL KINDS OF SERVICE.



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PATENT UNIVERSAL SCREW-CUTTING, CENTER, DEPTH, ANGLE AND **TWIST DRILL GAUGE.**
J. WYKE & CO.
Fine Machinists' Tools, E. BOSTON, MASS. Send for Circular.

DRAWING INSTRUMENTS Send for 72-Page ILLUSTRATED CATALOGUE. WM. T. COMSTOCK, 6 Astor Place, - New York.

STEWART'S IRON FIBRE PAINT

COLORS RED AND BROWN.
For painting ROOFS, FACTORY and FARM BUILDINGS, FENCES, IRON WORK, EXPOSED BRICK WALLS, &c. Made of Pure Linseed Oil and highest grades of Iron Oxide. Send for Circular. Address W. H. STEWART, 74 Cortlandt Street, New York.
READY ROOFING, for new roofs.

FOR SALE AT A BARGAIN.

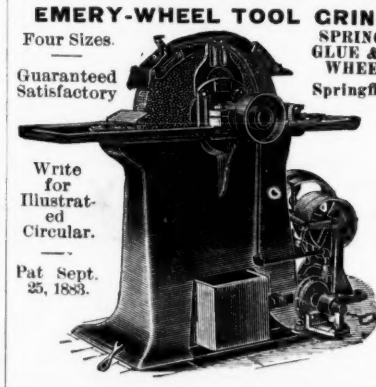
A well established and good paying machine shop and foundry, including buildings, lots, machinery and stock, situated in Leadville, Col. The business will be carried on until sold, thus at once giving a profitable trade to the purchaser. Address,

A. FALKENAU,
Care of Dickson Mfg. Co.,
Scranton, Pa.

Only reason for selling, ill health.

H.W. JOHNS' ASBESTOS
Roofing, Building Felt,
Steam Packings, Boiler Coverings,
Fire Proof Paints, Cements, Etc.
Samples and Descriptive Price Lists Free.
H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y.
175 Randolph St., Chicago; 170 N. 4th St., Philadelphia.

EMERY-WHEEL TOOL GRINDER.
Four Sizes.
Guaranteed Satisfactory



Write for Illustrated Circular.

Pat Sept. 25, 1883.

Water runs on wheel and prevents heating.

SPRINGFIELD GLUE & EMERY WHEEL CO., Springfield, Mass

IF YOU WANT A STRONG, ECONOMICAL
ENGINE,
Either *Horizontal* or *Vertical*,
For steady every-day and all-night service, and at a *Low Price*, write to
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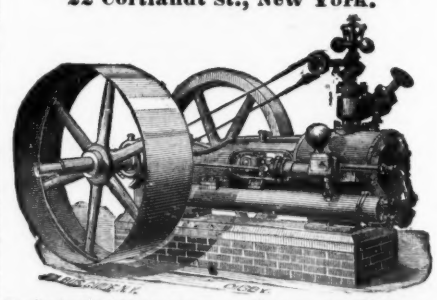

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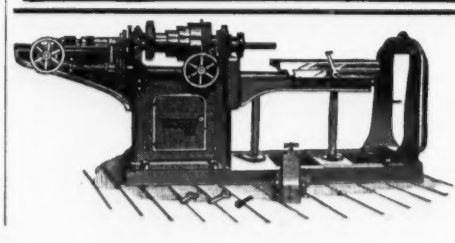

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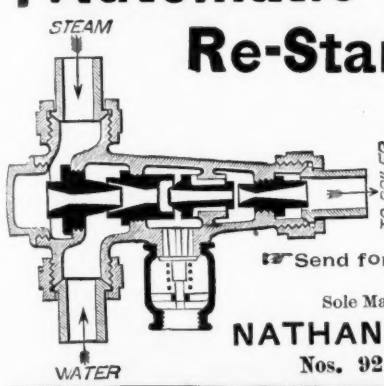

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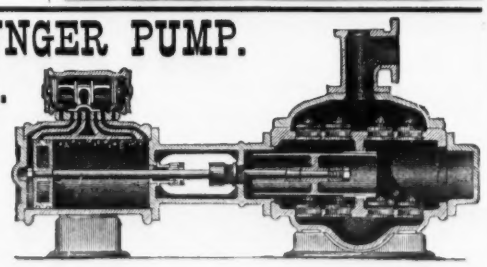

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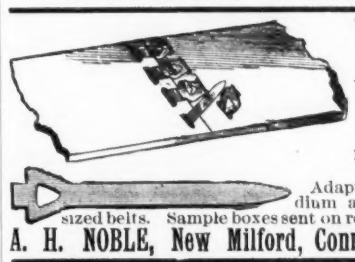

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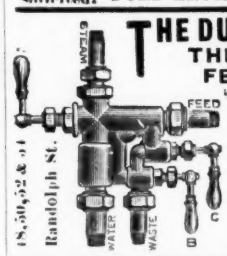

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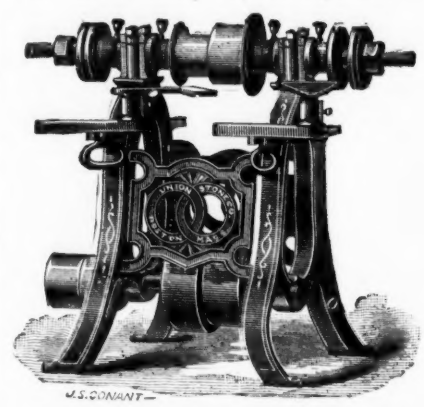

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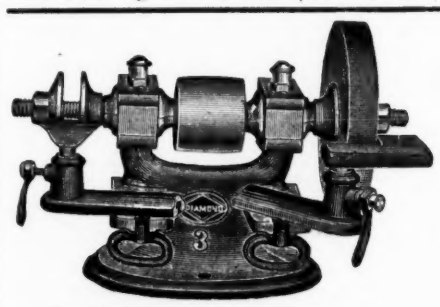

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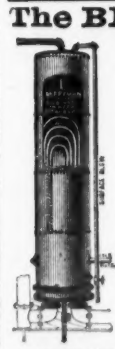

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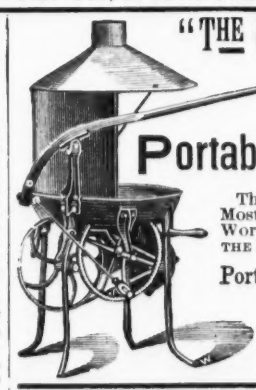

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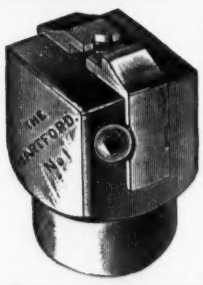

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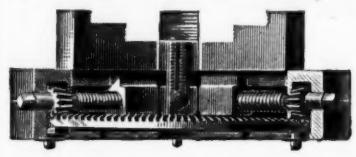

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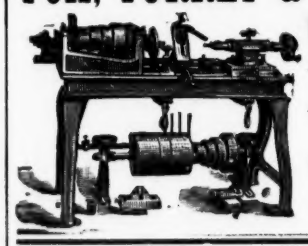

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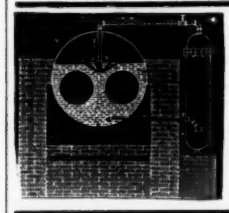

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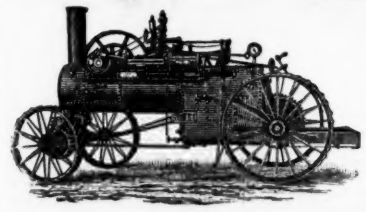

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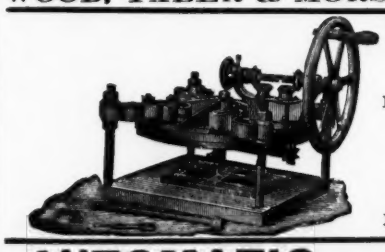

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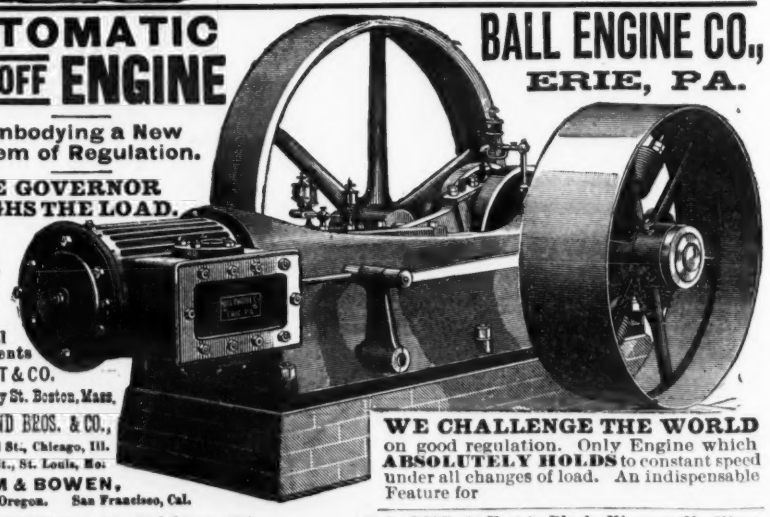

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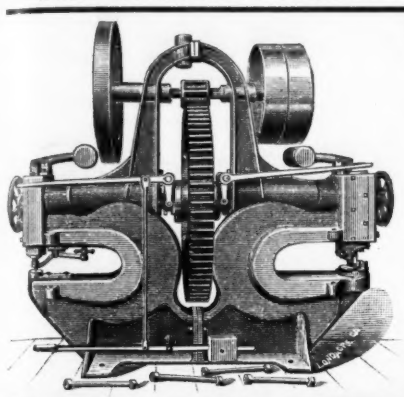

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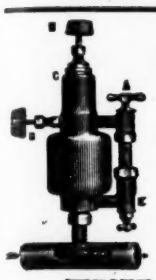

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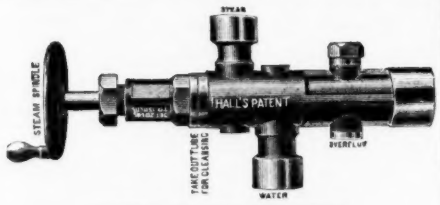

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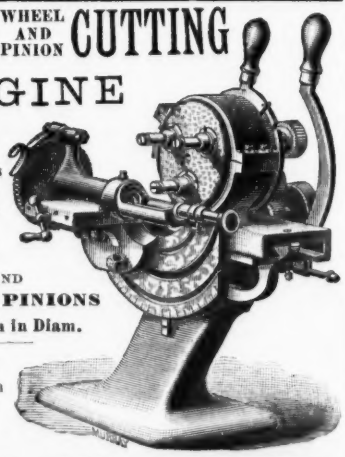

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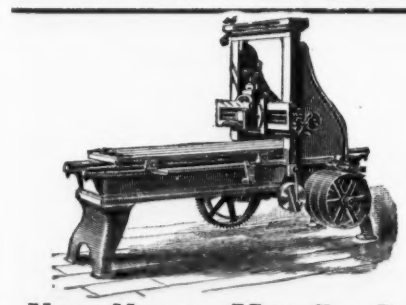

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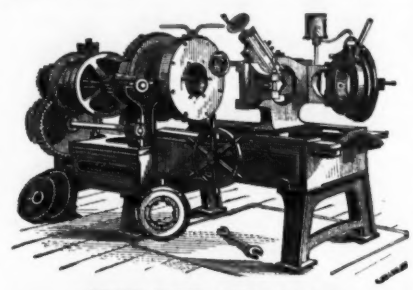

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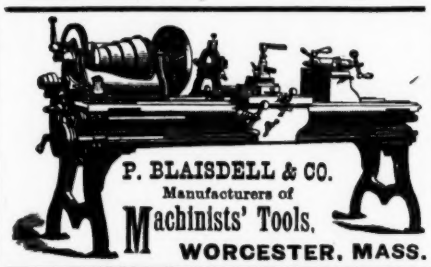

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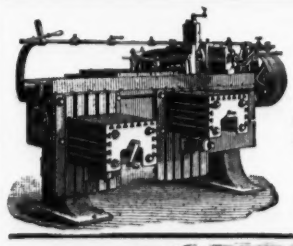

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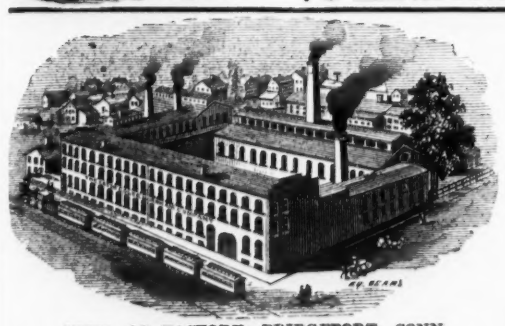

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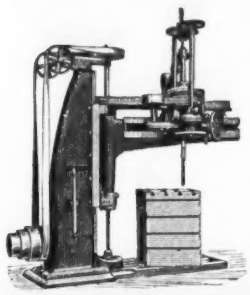

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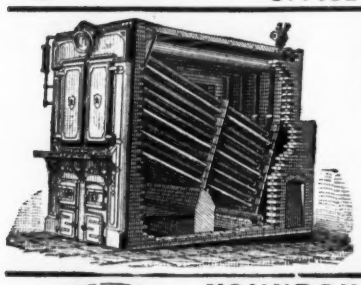

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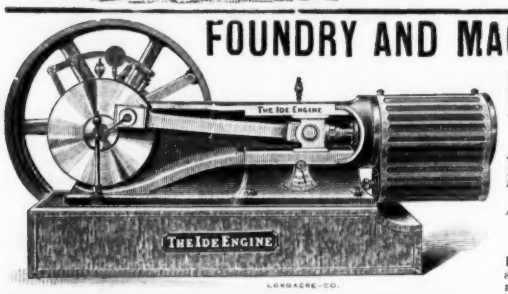

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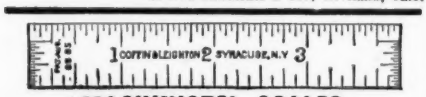

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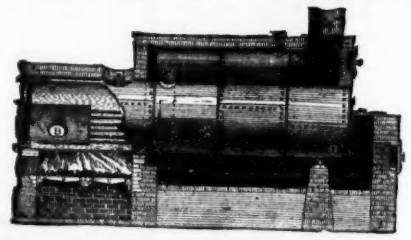

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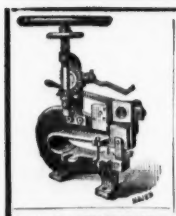

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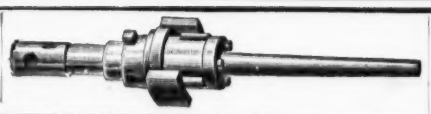

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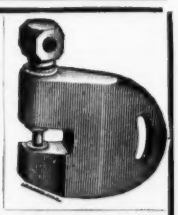

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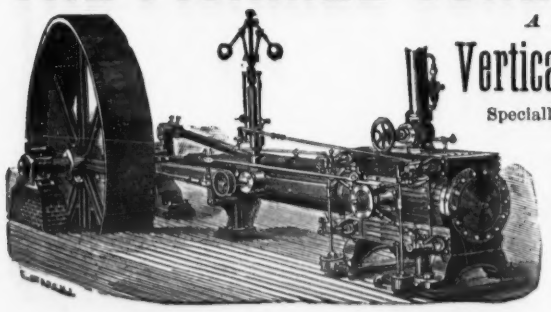

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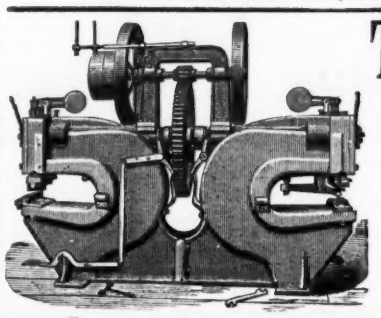

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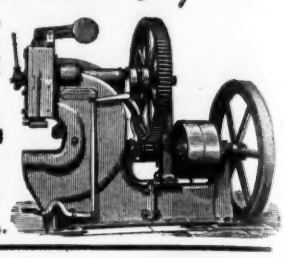

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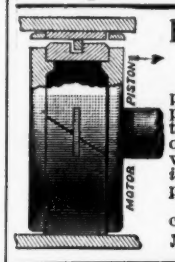

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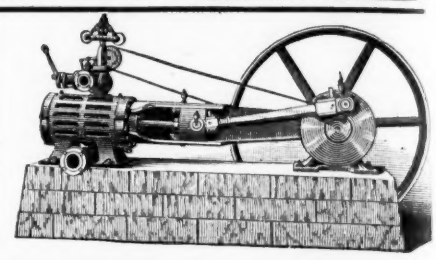

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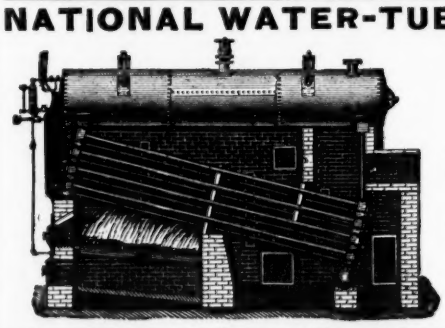

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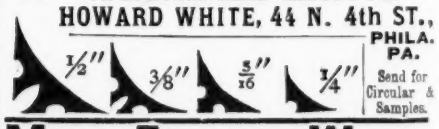

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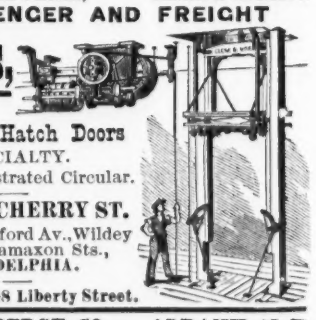

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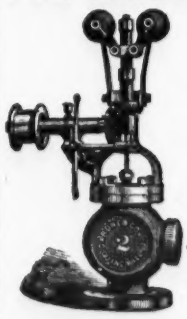

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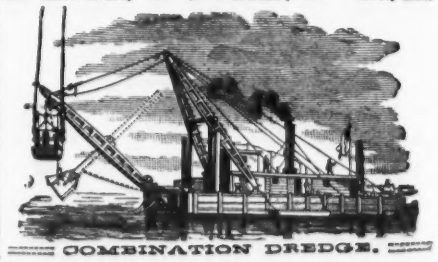

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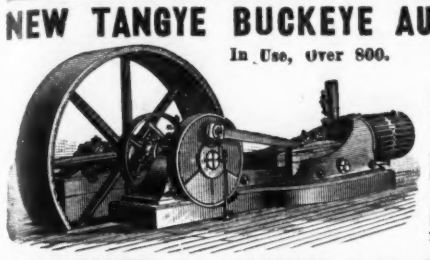

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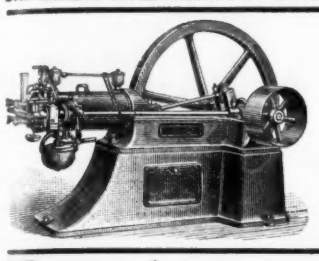

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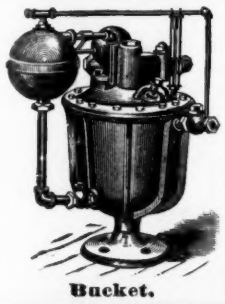

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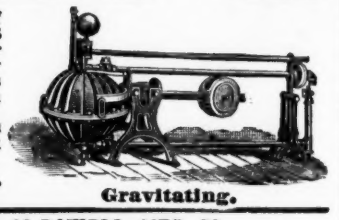

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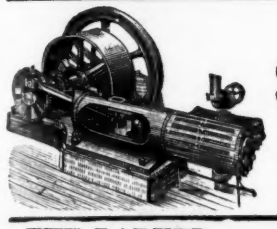

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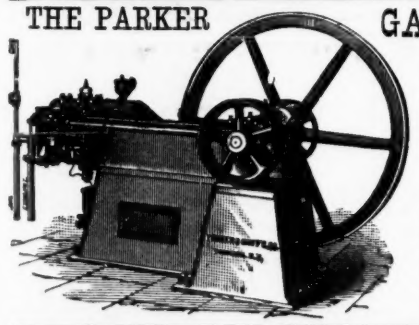

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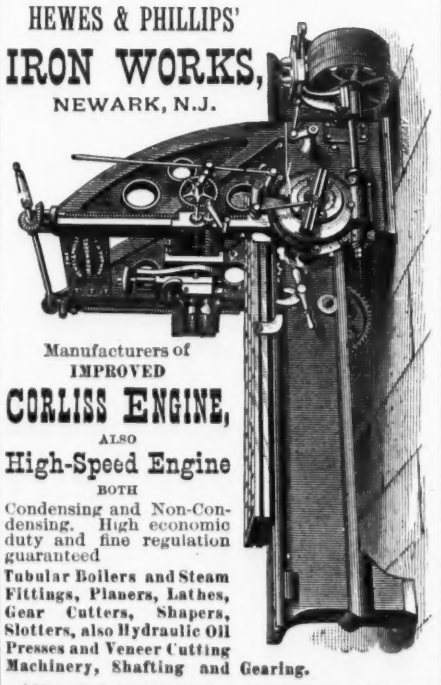

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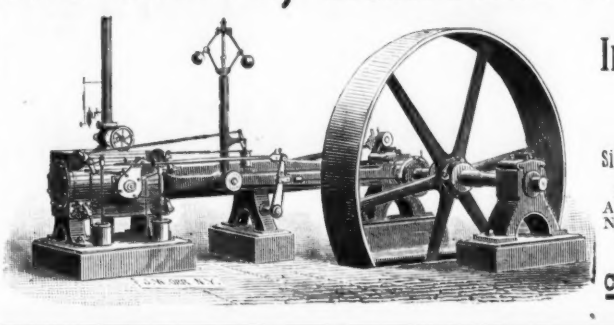

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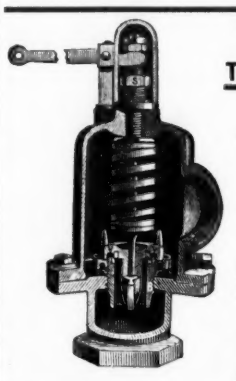

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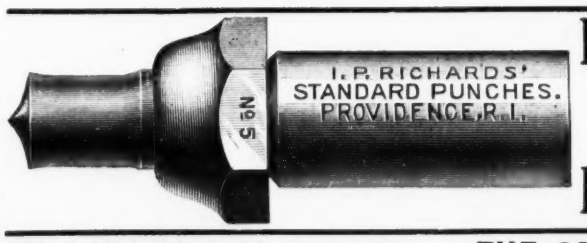

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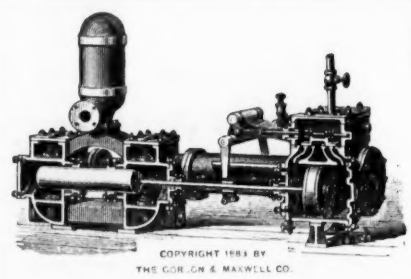

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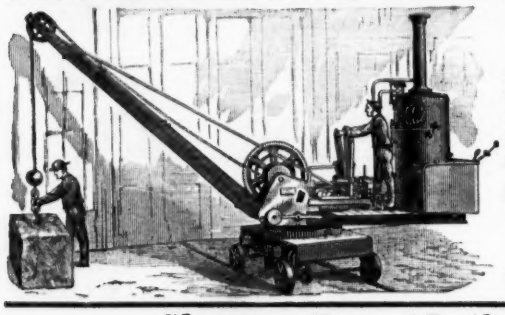

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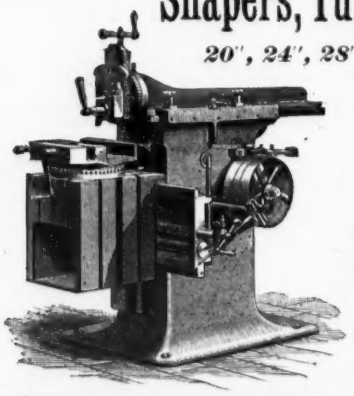

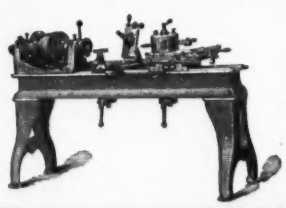

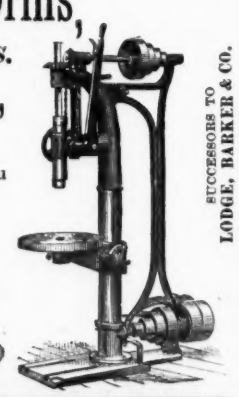

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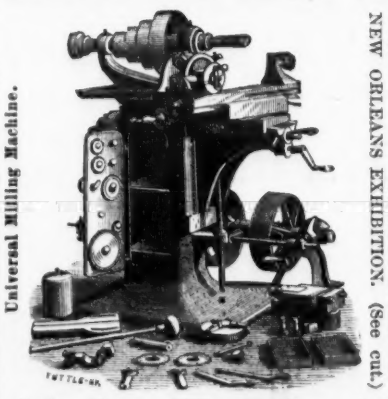

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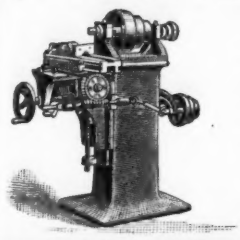

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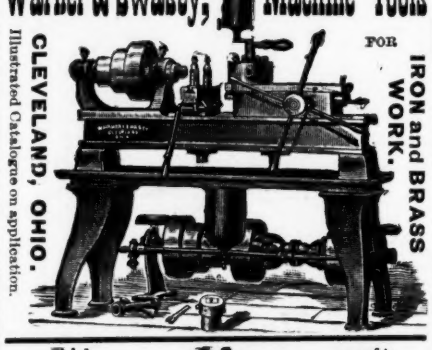

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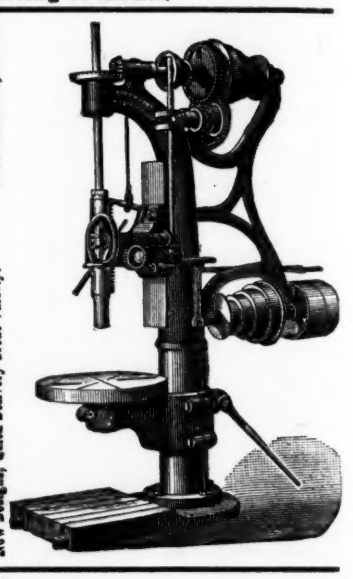

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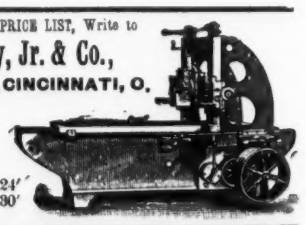

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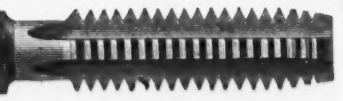

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